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# SCIENTIFIC INFORMATION REPORT

## Chemistry and Metallurgy

(23)

Summary No. 4061

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Prepared by

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C-O-N-F-I-D-E-N-T-I-A-L  
SCIENTIFIC INFORMATION REPORT  
Chemistry and Metallurgy (23)

This is a serialized report consisting of unevaluated information prepared as abstracts, summaries, and translations from recent publications of the Sino-Soviet Bloc countries. It is issued in six series. Of these, four, Biology and Medicine, Electronics and Engineering, Chemistry and Metallurgy, and Physics and Mathematics, are issued monthly. The fifth series, Chinese Science, is issued twice monthly, and the sixth series, Organization and Administration of Soviet Science, is issued every 6 weeks. Individual items are unclassified unless otherwise indicated.

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I. CHEMISTRY

Aerosols

1. Czechoslovak Automatic Aerosol Sampler

"Automatic Sampler for Aerosols," by K. Spurny and M. Polydorova, Institute of Physical Chemistry, Prague; Prague, Pracovni Lekarstvi, Vol 14, No 7, Sep 62

The article describes an apparatus for routine automatic collection of aerosols from the atmosphere and presents instructions for its operation. The 24 samples of aerosol automatically collected on membrane filters in the course of 24 hours may be examined either later in a laboratory or concurrently and automatically on the spot. For this purpose, three different methods are put forward: (1) recording irradiation from radioactively tagged filters after adsorption in the layer of the collected aerosol; (2) recording the intensity of light passed through and reflected by the dusty filter; and (3) recording the pressure fall on the dusty filter. (FOR OFFICIAL USE ONLY) (COPYRIGHT by the State Medical Publishing House, Prague, 1962)

2. New Czechoslovak Membrane Filter

"Use of the 'Synthesia' Membrane Filter for Determination of Concentrations of Aerosols," by J. Simecek, V. Vondracek, and K. Spurny, Institute for Work Hygiene and Occupational Diseases and the Institute of Physical Chemistry of the Czechoslovak Academy of Sciences, Prague; Prague, Journal of Hygiene, Epidemiology, Microbiology and Immunology, Vol 6, No 3, [Sep] 62, pp 368-376

The article deals with the development of methods for measuring dust concentrations by means of membrane filters. A new sampling head for membrane filters and qualities of the new "Synthesia" filters produced in Czechoslovakia are described. Results of experiments made with "Synthesia" filters are presented with regard to resistance, hygroscopicity, elasticity and homogeneity, contraction, transparency, clogging and efficiency. In conclusion, the prospects and trends for the development of membrane filters and their application in public and industrial hygiene are discussed. (FOR OFFICIAL USE ONLY) (COPYRIGHT by the State Medical Publishing House, 1962)

Agricultural Chemistry

3. New Unit for Production of Ammonium Sulfate

"Steps in the Seven-Year Plan -- Makeyevka"; Moscow Trud,  
No 184 (12660), 7 Aug 62, p 1

"A unit for the production of ammonium sulfate by methods not employing saturators was built at the Makeyevka Coke and Chemical Plant. Fertilizer is obtained in the form of coarse crystals which do not fuse together during storage. Ammonium sulfate now contains a lower percentage of oxygen and moisture so that it may be packed in paper bags."

4. New Growth Stimulator Used in Azerbaydzhan

"NRV on the Fields," by A. Khalilov, Deputy Minister of Production and Storage of Agricultural Crops of the Azerbaydzhan SSR; Baku, Bakinskiy Rabochiy, No 151, 30 Jun 62, p 2

Azerbaydzhan has been using an effective and cheap growth stimulator called NRV (neftyanoye rostovoye veschestvo, growth substance made from petroleum). Seeds are soaked in NRV prior to planting. The substance, mixed with mineral fertilizer, is again applied during the vegetation period and, finally, is sprayed over the plants during flowering. Spraying is done by a hand apparatus called "Avtomaks," by "ODN" machines, or by airplane. It has been used successfully on wheat, fruits, vegetables, grapes, tea, and tobacco and increased the cotton yield of certain regions by 4.5-8.5 centners per hectare.

Khalilov hopes that the reluctance of many farmers to use the substance will be overcome.

5. Nonchlorinated Nitrophosphate Fertilizer Gives Excellent Test Results

"New Mineral Fertilizer"; Kiev, Pravda Ukrainy, No 121, 24 May 62, p 2

"Professors of physics and colloidal chemistry at the Ukrainian Agricultural Academy have worked out the composition and a simplified technology for the production of a new mineral fertilizer -- a nonchlorinated nitrophosphate, using as basic raw materials superphosphate and potassium salts from Kalushkiy deposits (Stanislavskoy region).

"In distinction from fertilizers which provide only one nutritive element, nonchlorinated nitrophosphate contains potassium, sodium, phosphorus, and nitrogen. Chlorine, which has a harmful effect on plant growth, is completely absent. In each kilogram of this fertilizer, there are 2-3 times more nutritive materials than in simple fertilizers.

"The testing of nonchlorinated nitrophosphate by the co-workers at the Institute of Plant Physiology of the Academy of Sciences of the Ukrainian SSR on the kolkhozes of the Kiev region shows its high effectiveness in the cultivation of beets, winter grains, potatoes, cabbage, flax, and other foodstuffs and commercial crops. Use of the nitrophosphate on the kolkhoz "Kommunist" gave a clear gain of 54 rubles per hectare. The quantity of starch in potato tubers increased 1-2 percent, and the ascorbic acid content increased significantly. Interesting results were observed on the farms of the Zarya Kolkhoz in the Borodyanskiy region. The height of the crops increased significantly, and the yield of grain and straw increased 3-4 centners per hectare.

"The workers of Dneprodzerzhinskiy nitrogen-fertilizer plant have mastered the production method and have produced the first pilot-plant lot of nonchlorinated nitrophosphate."

### Insecticides

#### 6. Activated Creolin Oils Used As Insecticide

"Chemical Cloud Wipes Out Pests"; Kishinev, Sovetskaya Moldaviya, No 149, 27 Jul 62, p 1

"Barnaul. Activated creolin oils, discharged from an aerosol generator, form a poisonous cloud which kills agricultural pests -- garden beet and grain beetles of the gray-beet snout-beetle family. The chemical could act over a distance of 2 kilometers. The apparatus can cover 500-700 hectares per hour.

"This method of pest extermination was developed by Prof E. Cherkaskiy, and the generator, mounted on a truck chassis, was designed by government prize laureate S. Novikov.

"In the Altayskiy Kray, about 5,000 hectares of crops have already been treated. Experiments show the high effectiveness and economic advantages of the new apparatus."

7. Cyclohexylarsenous Acid Chlorides Synthesized

"Chlorides and Mixed Esters of Cyclohexyl- and Dicyclohexylarsenous Acids," by M. Gil'm Kamay, and R. G. Miftakhova, Kazan Chemical-Technological Institute; Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 2839-2844.

The acid chlorides of cyclohexyl- and dicyclohexylarsenous acids were synthesized by treating arsenic trichloride with cyclohexyl alcohol. The corresponding acid amides were obtained by treating the acid chlorides with diethylamine. Several mixed esters of arsenous acid were obtained by treating cyclohexyl- and dicyclohexylarsenous acid chlorides with alcohols in the presence of pyridine and ethyl alcohol. The mixed esters have a tendency to disproportionate.

8. Benzaldehyde and Furfurol Chloroacetals Tested for Biological Activity

"Research in the Field of Simple Esters of Glycols and Their Derivatives, XLVII; Synthesis of Acetals of Aromatic and Heterocyclic Aldehydes," by M. Mamedov and M. A. Avanesyan, Institute of Heterochemical Processes, Academy of Sciences Azerbaydzhan SSR; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 2834-2838

Benzaldehyde acetal and furfural acetal were prepared by heating mixtures of the corresponding aldehyde, alcohol, and benzene. The yield of benzaldehyde acetal was 68 percent. The preparation of furfural acetal required the presence of calcium chloride as catalyst. Optimum yields were obtained by using a 50-percent excess of alcohol. It was established that the chlorine in the cyclic acetals of benzaldehyde and furfural is very stable.

Biological tests were conducted which showed that the cyclic chloroacetals of benzaldehyde and furfural are active. It was shown previously that formaldehyde acetal possess insecticidal properties and that the purpose of the present work was to synthesize and test aromatic and heterocyclic aldehyde acetals for biological activities.

9. Book on Testing Toxic Preparations

"Testing Formulations Having Properties for Repelling Mosquitoes, Ticks, and Fleas," by V. I. Vashkov, Metody Issled. Dezinfekts., Dezinsakts. i Deratizats. Preparatov (Methods for Testing Disinfectants, Insecticides, and Raticides), Moscow, Medgiz, 1961, pp 293-209 (from Refertivnyy Zhurnal -- Khimiya, No 18, 25 Sep 62, Abstract No 18L315)

"Methods are presented for testing formulations in the field and in the laboratory."

Medical Chemistry

10. Medication for Dysentery and Other Diseases

"News of Science and Technology"; Moscow, Trud, No 150, 28 Jul 62, p 3

"Soviet scholars have developed a new medicinal preparation -- iodinol. It is used to treat dysentery, pleurisy, chronic angina, and ear, throat, and nose diseases."

11. New Chemicals From Berberine

"In the Chemistry Labs of Tadzhik"; Dushanbe, Kommunist Tadzhikistana, No 206, 2 Sep 62, p 4

"In the laboratory of the chemistry of vegetable materials, Candidate of Chemical Sciences S. Davidyants and his helpers, Yu. Sadykov and V. Degtyarev, conducted a series of experiments on obtaining new chemical materials from berberine.

"Berberine is a substance contained in the well-known barberry plant and is a medicinal remedy. Combining berberine with other substances, the scientists produced several new medicinal preparations which should now be subjected to pharmacological and microbiological tests."

Organophosphorus Compounds12. Reactions of Dialkylphosphates With Triarylhalomethanes Studied

"The Reactions of Certain Substituted Triarylchloro- and Bromomethanes With Salts of Dialkylphosphorous Acids," by Academician A. Ye. Arbuzov and Chang ching-Lind, Kazan Department, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 144, No 5, 11 Jun 62, pp 1039-1041

A study was made of the reactions between salts of dialkylphosphorous acids and mono-p-anisilphenyl-, di-p-anisilphenyl-, and tri-p-anisilbromomethanes and halogen-substituted triarylhalomethanes. Peroxides of the corresponding triarylmethyl radicals were unexpectedly obtained by slightly altering the reaction conditions in the reaction between triarylbromomethanes and sodium diethyl-phosphate. The alteration consisted of adding an ether solution of the sodium diethylphosphate to pulverize crystalline triaryl-bromomethane. The formation of free radicals under these conditions was confirmed by E. P. R. Spectra. A proposed mechanism for the reaction is presented.

13. Asymmetric Phosphorus Compounds Synthesized

"Asymmetric Phosphorus Compounds. I," by Gil'm Kamay and G. M. Rusetskaya, Chemical Institute imeni A. Ye. Arbuzov, Academy of Sciences USSR; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 2848-2854

Some new asymmetric tertiary phosphines of the phenyl ethyl alkyl phosphine series were prepared. The purpose of the present work was to develop a more convenient method for the preparation of tertiary asymmetric phosphines. Previously, these compounds were synthesized by thermal decomposition of dialkylphenylbenzyl phosphonium chlorides. According to the present method, phenylethylchlorophosphine was treated with organomagnesium compounds of the corresponding alkyl halides to give asymmetric phosphines.

14. Asymmetric Tertiary Phosphines Synthesized

"Asymmetric Phosphorus Compounds. II," by Gil'm Kamay and G. M. Rusetskaya, Kazan Chemical-Technological Institute; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 2854-2858

A study was made of the synthesis of some new asymmetric phosphines and phosphonium compounds containing the p-tolyl group. Asymmetric quarternary covalent phosphonium compounds were prepared from p-tolyl-dichlorophosphine which was first converted to ethyl-p-tolylchlorophosphine. This compound was then treated with corresponding alkyl-magnesium halides to give asymmetric tertiary phosphines.

15. Phosphorylated Guanidines Prepared

"N-Diethylenediamidophosphonyl-N'-ethylene-N"-arylguanidines," by G. I. Derkach, L. D. Protsenko, L. P. Zhuravleva, and A. V. Kirsanov, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 2992-2994

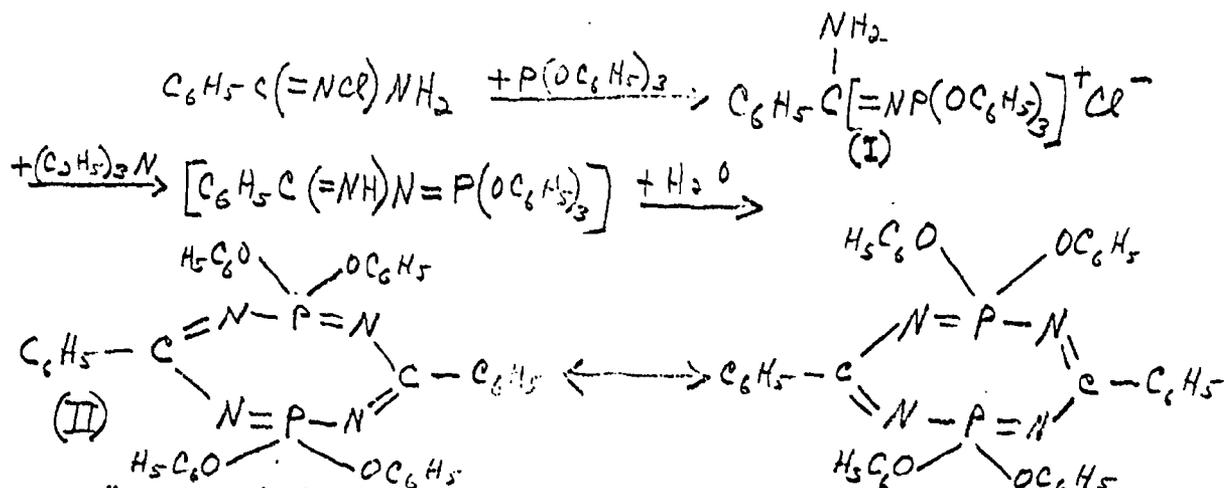
N-Diethylenediamidophosphonyl-N'-ethylene-N"-arylguanidines were prepared by treating ethyleneimine with N-dichlorophosphonyl-N'-aryl-C-chloroformamidines. This product is insoluble in dilute sodium hydroxide and polymerises in the presence of dilute mineral acids.

16. Heterocyclic Organophosphorus Compounds

"A Heterocyclic System Containing Phosphorus and Nitrogen," by G. I. Derkach, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 37, No 9, Sep 62, p 3107

"In the reaction of triphenylphosphite with N-chlorobenzamidine, an addition product (I) is formed which, on subsequent treatment with triethylamine in benzene followed by aqueous alcohol, is converted to an organophosphorus compound (II) having the composition  $C_{38}H_{30}O_4N_4P_2$ .

"Substance (II) is probably a cyclic system of an aromatic nature because, in the infrared spectra, frequencies characteristic for the N=P and C=N bonds are lacking.



"Compound (II) is a colorless crystalline substance with a melting point of 139-140°C."

#### 17. Catalytic Activity of Phosphorus Pentachloride Clarified

"New Type of Cationic Catalysis IV. Catalytic Activity of Phosphorus Pentachloride in Reactions of Phenols With Phosphorus Oxychloride," by V. V. Katyshkina and M. Ya. Kraft, All-Union Scientific-Research Chemico-pharmaceutical Institute; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 3096-3098

The reaction of phenols with phosphorus oxychloride is found to be accelerated considerably when conducted in the presence of phosphorus pentachloride. The phosphorus pentachloride does not possess catalytic activity, but it does form compounds of the type  $(\text{ArO})_3\text{PCl}_2$  or  $(\text{ArO})_4\text{PCl}$ . These compounds, when in solution with  $\text{POCl}_3$ , are capable of dissociation and behave like salts of strong bases, so that they may be considered as true phosphonium compounds.

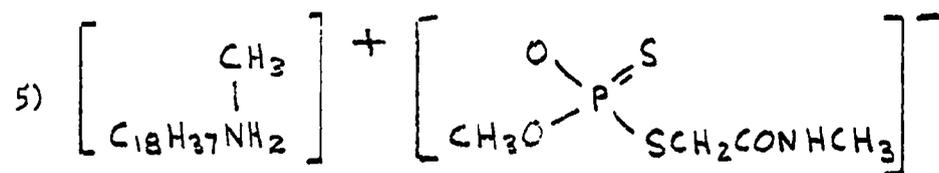
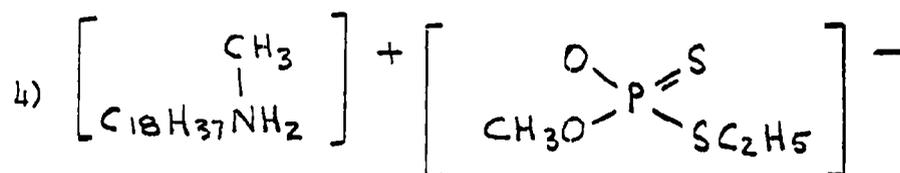
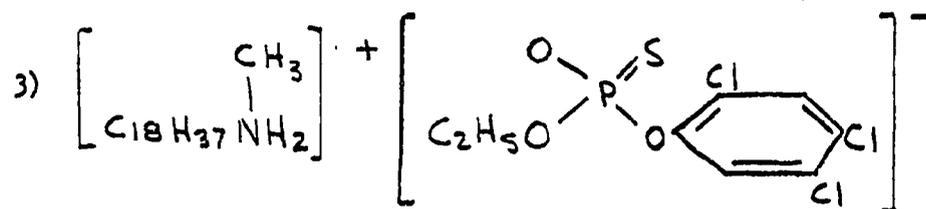
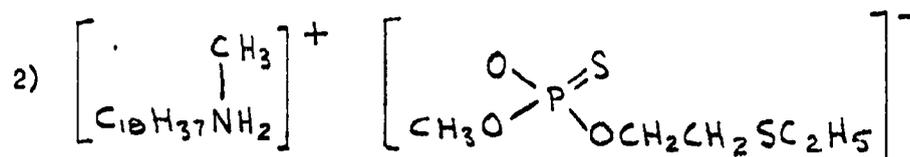
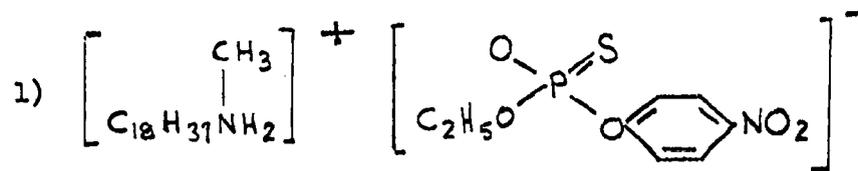
#### 18. Ammonium Salts of Thiophosphoric Acid Synthesized

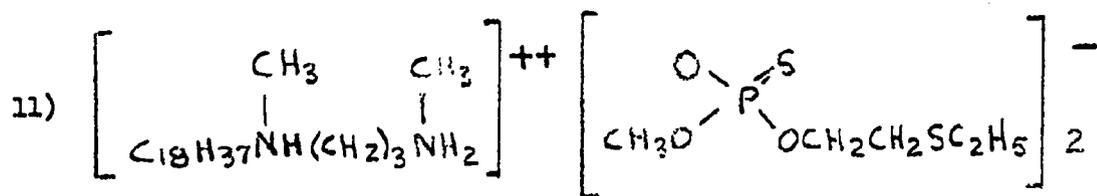
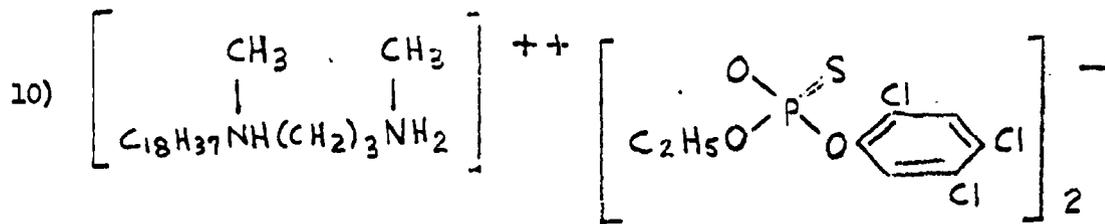
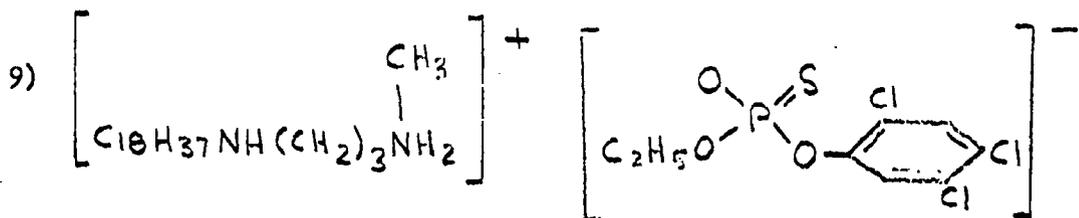
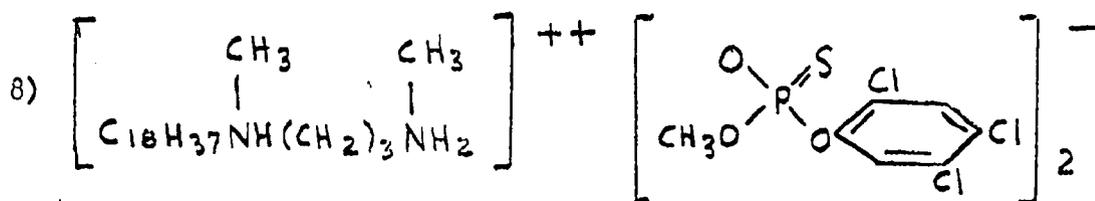
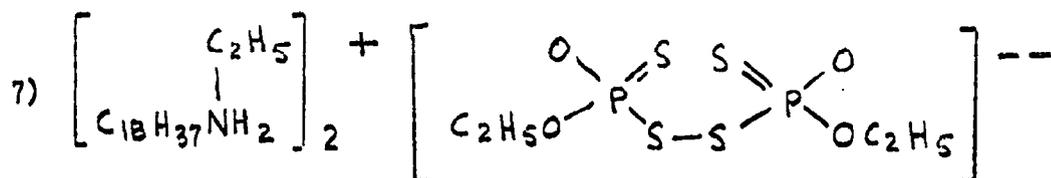
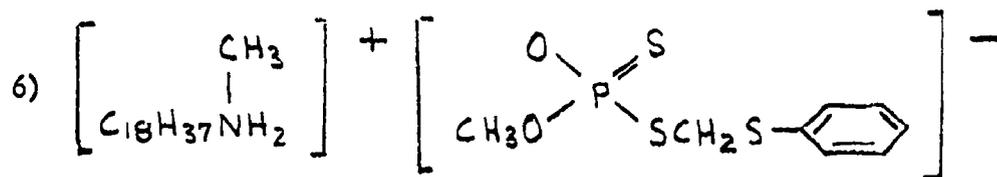
"From the Field of Organic Insectofungicides LXVII. Reaction of Esters of Thio- and Dithiophosphoric Acids With Higher Aliphatic Amines and the Fungicidal and Bactericidal Activity of the Reaction Products," by M. M. Mel'nikov, B. A. Khaskin, K. D. Shvetsova-Shilovskaya, G. M. Pershin, and S. N. Milovanova, Scientific Institute for Fertilizers and Insectofungicides; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 2858-2863

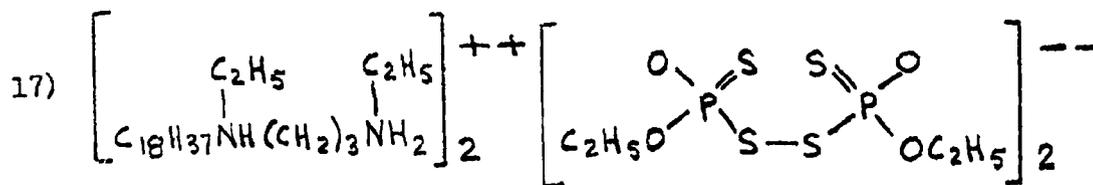
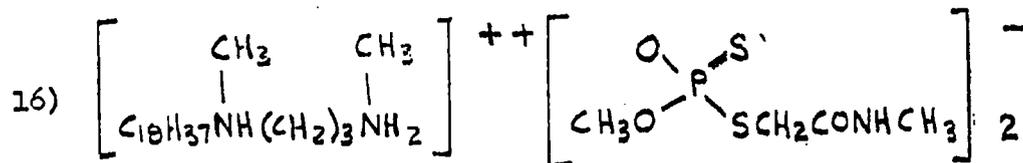
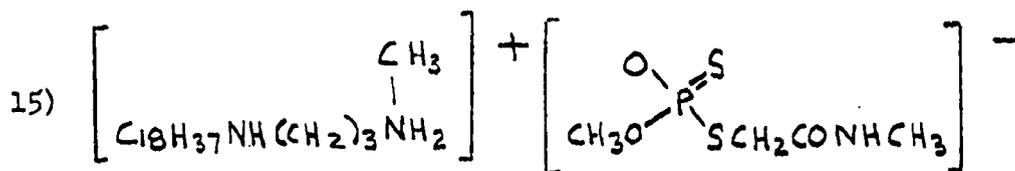
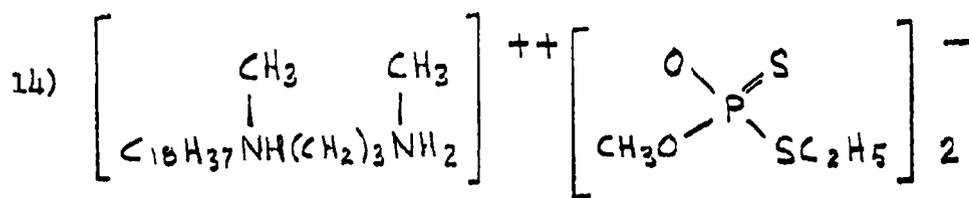
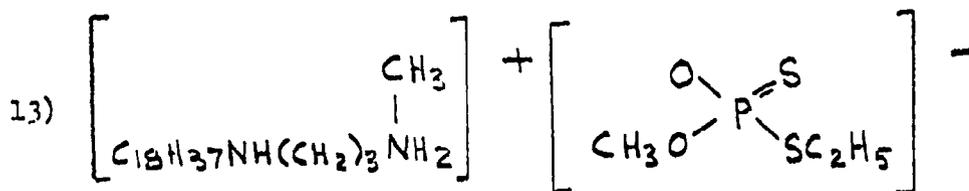
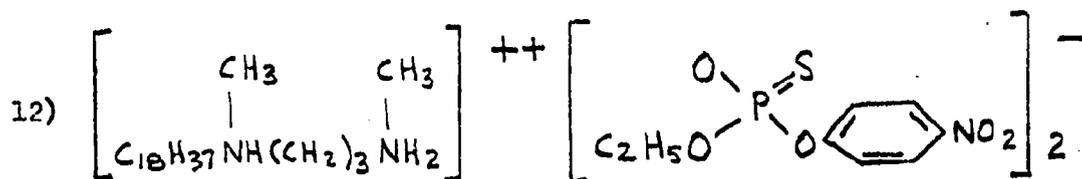
It was previously shown that primary, secondary, and tertiary amines react with aliphatic and aliphatic-aromatic esters of thio- and dithiophosphoric acids to give ammonium salts of the esters of these acids. It is

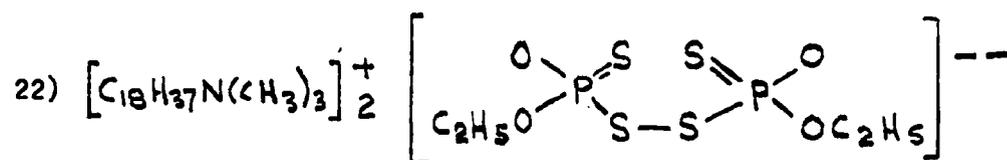
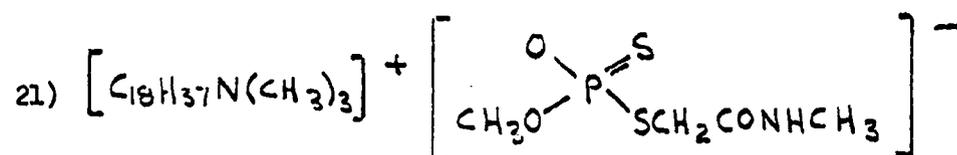
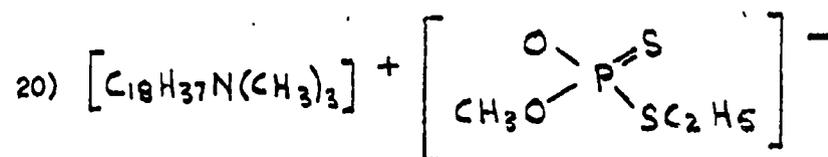
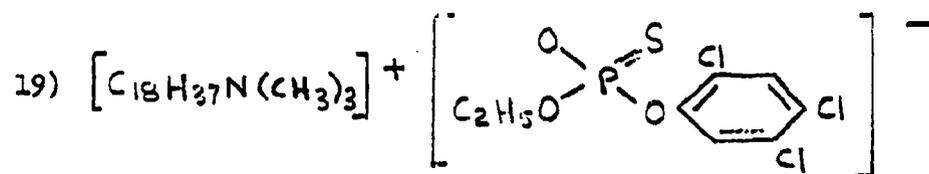
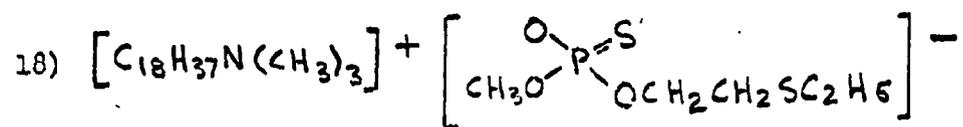
also known that many ammonium salts containing higher alkyl groups in their composition possess high bactericidal activity and that this activity increases on introducing complex ester groups into the cationic portion of the molecule. Realizing that many esters of phosphorus acids are physiologically active compounds and that many of them are transmitted throughout the circulatory system of plants without being bound up with organic substrates, the authors synthesized and studied compounds containing both higher alkyl groups in the ammonia group and phosphorus-ester groups.

Compounds of this type may be synthesized either by reaction of higher primary and tertiary aliphatic amines and primary and secondary diamines with esters of thio- and dithiophosphoric acids, or with bis (dialkoxythiophosphon) disulfides. This reaction occurs readily at 80-100°, and the corresponding salts are obtained in practically quantitative yields.









The results show that salts of the acid esters of thio- and dithio-phosphoric acids have very high fungicidal and bactericidal activity. In fact, some phosphorus-containing ammonium compounds exceed by far the bactericidal and bacteriostatic activity of corresponding ammonium compounds of inorganic acids. For example, the minimum concentration of dimethylethyloctadecylammonium iodide to inhibit growth of tuberculosis bacillus is  $2 \times 10^{-4}$  percent, while that of the new compounds numbers 19, 20, and 21 is  $1 \times 10^{-4}$  and  $5 \times 10^{-5}$ . Similarly, growth of avian tuberculosis is arrested with numbers 6, 18, 19, 20 and 21 in concentrations ranging from  $5 \times 10^{-5}$  to  $6.2 \times 10^{-6}$  percent.

This large change in microbiological activity of the synthesized compounds in comparison with previously known compounds may be explained only as being due to the influence of anions containing esters of thio- and dithiophosphoric acids.

#### 19. Isomerization of Ethyldichlorothiophosphate Studied

"Isomerization of Ethyldichlorothiophosphate," by Ye. M. Popov and M. Ye. Nedenikova; Moscow, Zhurnal Obschey Khimii, Vol 32, No 9, Sep 62, pp 3080-3083

A study was made of the kinetics of thermal isomerization of ethyldichlorothiophosphate at  $80^{\circ}$ ,  $100^{\circ}$ , and  $120^{\circ}\text{C}$  for 6 hours. Infrared spectra show that isomerization does not take place at  $80^{\circ}$  and that at  $100^{\circ}$  only a very small amount is isomerized. Heating at  $120^{\circ}$  for 6 hours results in complete isomerization of ethyldichlorothiophosphate into ethyldichlorothiolphosphate. The isomerization kinetics apparently follows the autocatalytic reaction equation.

#### 20. Organophosphorous Derivatives of Monose Synthesized

"Synthesis and Chemical Properties of 1,4; 3,6-Dianhydrohexite Phosphonites," by K. A. Petrov, E. Ye. Nifant'yev, A. A. Shchegolev, and N. A. Khudyntsev; Moscow, Zhurnal Obschey Khimii, Vol 32, No 9, Sep 62, pp 3074-3080

The simple and mixed esters of dianhydrohexites have been recommended for use as plasticizers, emulsifiers, and insecticides, while the dinitrates of dianhydromannite and dianhydrosorbite have been recommended as formulations for lowering blood pressure. In the present work, data are presented on the synthesis of dialkylphosphonites of 1,4; 3,6-dianhydrohexites and their conversion to corresponding phosphonates, thionephosphonates, and halogen

and aminodesoxydianhydrohexites. Phosphorylation was carried out by transesterification and alcoholysis of amidophosphonites. Oxidation and sulfur addition reactions were conducted on the biphosphonites of dianhydrohexites. A method is proposed for a preparation of dihalogenodianhydromannite via the alkylation of dianhydromannite bisphosphonite.

21. New Method for Synthesis of Arylthiophosphites and Arylthiophosphonites

"Properties of Phosphorus Acid Amides V. Reactions of Phosphorous and Phosphonous Acid Amides With Thiophenol and Mercaptans," by K. A. Petrov, V. P. Yevdakov, G. I. Abramtseva, and A. K. Straupman; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 3070-3074

A new method was developed for the synthesis of arylthiophosphites and arylthiophosphonites based on the reaction of phosphorous and phosphonous acid amides with thiophenols or with the salts of thiophenol and diethylamine. It was shown that benzylmercaptan reacts with trivalent phosphorus acid amides to form thionederivatives of pentavalent phosphorus and thiobenzyl esters of trivalent phosphorus. Alkylmercaptans react with phosphorous and phosphonous acid amides to form only thiophosphoric and thiophosphonic acid amides.

22. Reactions of Phosphorus Acid Amides Studied

"Properties of Phosphorus Acid Amides IV. Aminolysis and Phenolysis Reactions of Amidophosphites and Amidophosphonites," by K. A. Petrov, V. P. Yevdakov, K. A. Bilevich, and V. I. Chernykh; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 3065-3069

A study was made of aminolysis reactions of amidophosphites and amidophosphonites. It was found that this reaction depends on the chemical and physical properties of the reagents. Thus, in treating dibutylphosphorous acid dialkylamides with secondary amines, the reaction takes place more readily with cyclic amines such as piperidine than aliphatic amines. Amides which are derivatives of low-boiling amines, such as dimethylamine, react with phenol even at room temperature. The reaction becomes more difficult as the molecular weight of the amine increases. Conducting the reaction at high temperatures results in diproportionation of the initial amide and of the product. Amidophosphites and amidophosphonites may be used to synthesize various derivatives of trivalent phosphorus.

23. New Method for Synthesis of Thiophosphonates

"Properties of Phosphorus Acid Amides III. New Method for the Synthesis of Thiophosphites and Thiophosphonites," by K. A. Petrov, V. P. Yevdakov, L. I. Mizrakh, and V. P. Romodin; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 3062-3065

Experiments show that hydrogen sulfide reacts readily with amido phosphites and amido phosphonites at 80°-100°C to give thiophosphites and thiophosphonites in comparatively good yields. The initial amido phosphonites were obtained via the corresponding chloramides. Methylthiophosphonites react with dialkyldisulfides to form the corresponding thiophosphonates. Phenylthiophosphonites react with tetraethylenediamides almost quantitatively to form corresponding phenyldiethylamidomethylthiophosphonites.

24. Nitrogen-Containing Organophosphorus Compounds Synthesized

"N-Dichlorophosphonyl-N'-alpha-chlorobenzalareneamidines," by G. I. Derkach, G. F. Dregval', and A. V. Kirsanov, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 3002-3007

Experiments show that phosphorus pentachloride reacts with N-benzoylareneamidines to form N-dichlorophosphonyl-N'-alpha-chlorobenzalareneamidines, which, on heating, decompose to N-dichlorophosphonylimino-carboxylic acid chlorides and carboxylic acid nitriles. Sodium phenolate reacts with N-dichlorophosphonyl-N'-alpha-chlorobenzalareneamidines to form N-diaroxyphosphonyl-N'-alpha-aroxylbenzalareneamidines. With aniline as reactant, N-dianilidophosphonyl-N'-alpha-anilidobenzalareneamidines are formed.

25. Organophosphorus Compounds Prepared From Malonic Acid

"Phosphorylation of Malonic Acid Esters," by V. I. Shevchenko, M. D. Bodnarchuk, and A. V. Kirsanov, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 2994-3001

Since malonic acid esters contain a small quantity of the enol form, it may be assumed that phosphorus pentachloride will react with this compound to some extent by addition to the enol oxygen, resulting in a phosphorylation reaction. The mechanism of this reaction has been worked out on the basis of styrene.

Experiments show that phosphorus pentachloride reacts readily with malonic acid diesters. The product is a mixture containing about 10 percent monochloromalonic acid diesters, 15 percent dichloromalonic acid dichlorides, and 45 percent dichlorophosphorylchloromalonic acid monochloride esters. Phosphorus pentachloride reacts with diesters of monosubstituted malonic acids and with malonic acid dichlorides only by chlorination of the methylene groups. Phosphorylation does not take place.

26. Atomic Refractions of Phosphorus in Pentavalent Compounds Determined

"Some New Forms of the Arbuzov Rearrangement XVII. Bond Refractions and Atomic Refractions of Phosphorus in Its Pentavalent Compounds," by V. K. Kukhtin and K. M. Kirilova, Kazan Branch, Scientific-Research Cinephoto Institute; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 2797-2800

The atomic refraction of phosphorus was calculated from data on the molecular refraction of phosphorus in 1,3,-dioxaphospholenes, which are intermediate compounds formed during addition of trialkylphosphites to diacetylene. The average value for the atomic refraction of phosphorus in these compounds was calculated to be 3.95. The refraction of the pentavalent P-C bond in aromatic compounds is 4.16 in pentaphenylphosphorus. It is shown that bond refractions of pentavalent phosphorus have a lower value than the bond refractions in trivalent phosphorus. The refraction of the P=O bond has a value of 3.654, not the negative value previously assigned to this compound which has no physical meaning.

Plastic27. "Pluton"--New Heat-Resistant Substance

"Pluton", Tbilisi, Zarya Vostoka, No 201, 28 Aug 62, p 4

"Molten steel was poured out onto this material and hardened into an ingot. Even after such "heat" treatment, the material was undamaged. It was made from a new organic substance called "Pluton." "Pluton" is 1 1/2 times as heavy as water and not very strong, but it has an unusually high melting temperature of 10,000 degrees.

"The heat conductivity of this substance is so low that a small plastic plate covered with it can be held in the hands while the strong flame of a gas burner is directed on it."

28. Piperylene Radiation Polymer Studies

"Structure of the Radiation Polymer of Piperylene," by A. I. Yaku Yakubchik and V. K. Smirnova; Leningrad, Zhurnal Prikladnoy Khimii, Vol 35, No 8, Aug 62, p 1870

A piperylene polymer was obtained by exposure to gamma radiation, and its chemical structure was studied by the use of infrared spectroscopy and by ozonolysis.

The infrared spectrum showed the polymer contains 6.5% 3,4-links (links with the vinyl groups) and 67% trans-(1,4+1, 2)-links. The presence of an absorption band corresponding to the cis-(1,4 +1,2)-links and 17.4% 1,2-links (links with the propenyl groups) was also noted. This was determined by calculating the ozonolysis reduction products, acetaldehyde and acetic acid. Oxidation of the polymer by ozonolysis showed the formation of dimethylsuccinic, methylsuccinic, and succinic acids on 5.2, 18.7, and 6.9% of the carbon chain, respectively.

From the data obtained, it was concluded that the radiation polymer of piperylene has an irregular structure.

29. Polymers Containing Phosphorus and Silicon Prepared

"Polymerization of Dinaphylcyclomethylphosphonoxysiloxanes," by K. A. Andrianov, T. V. Vasil'yeva, and L. M. Khananashvilli, Moscow Institute of Fine Chemical Technology; Moscow, Vysokomolekulyarnyye Soyedineniya, Vol 4, No 5, May 62, pp 708-713

The polymerization of inorganic cyclic compounds framed with organic groups is interesting in the study of the process for the formation of polymers containing inorganic trunk chains. In the present work, an attempt was made to polymerize inorganic cycles containing phosphorus, silicon, and oxygen and to copolymerize these cycles with octamethylcyclotetrasiloxanes.

In contrast to dimethylsiloxanes, dimethylcyclomethylphosphonoxysiloxanes polymerize very poorly in the presence of acid-base catalysts. During copolymerization of octamethylcyclotetrasiloxane with dimethylcyclomethylphosphonoxysiloxanes in the presence of an amount of water sufficient for hydrolysis of the dimethylcyclomethylphosphonoxysiloxane, the molecular weight increases with increasing silicon content. The resulting polymers structurize on standing in air and, thereby, decrease in solubility. Rubbery polymers were obtained for the first time which contain phosphorus in the dimethylsiloxane polymer chain. It was found that the presence of 9.02-0.03 percent phosphorus increases the rupture strength and the relative elongation.

30. Structure of Electrically Conducting Solid Polymers Studied

"Electrically Conducting Systems Based on Polymers II. Study of the Structure of Electrically Conducting Compositions Based on Hardened Resins," by V. Ye. Gul', N. S. Mayzel', A. N. Kamenskiy, and N. N. Fodiman, Moscow Institute of Fine Chemical Technology; Moscow, Vysokomolekulyarnyye Soyedineniya, Vol 4, No 5, May 62, pp 649-654

Many structural changes were found to take place during the hardening of phenolformaldehyde and epoxide resins from the viscous to the solid state. Both samples contain varying amounts of acetylene black. Measurements were taken with a special apparatus operatin in conjunction with a Polyani-type dynameter and a device for testing microhardness.

The results indicate that the hardening process has a profound effect on the electrical conductivity of the compositions. The hardening is accompanied by an increase in the true concentration of carbon black particles, owing to evaporation of the solvents and low molecular fractions, an over-all decrease in volume owing to cross-linking

of macromolecules, and possibly the formation of bridges between previously established elements of the carbon black structure. Simultaneously with the cross-linking of the macromolecules, aggregates of the carbon-black particles break up, which results in an increase in carbon particle concentration. The increase in carbon particle concentration and decrease in volume promote an increase in particle-particle contacts and, therefore, an increase in electrical conductivity of the system. The extent to which these processes develop depends on the rate of the structurization process, the intensity at which the low molecular components are evaporated, and the degree of cross-linking.

### 31. Structure of Electrically Conducting Unhardened Resins Studied

"Electrically Conducting Systems Based on Polymers I. Studying the Structures of Electrically Conducting Compositions Based on Unhardened Resins," by V. Ye. Gul', N. S. Mayzel, A. N. Kanetskiy, and N. N. Fodiman, Moscow Institute of Fine Chemical Technology; Moscow, Vysokomolekulyarnyye Soyedineniya, Vol 4, No 5, May 62, pp 642-648

The effect of structure vulcanizates on their dielectric properties has been demonstrated. Various types of carbon black are characterized by different shapes and sizes of the particles and by their capacity to form structures. Recently, the number of polymers used to obtain electrically conducting structures based on synthetic resins has not been attempted.

In the present work a study was made of the structure of compositions consisting of phenolformaldehyde resins containing various amounts of acetylene carbon and compositions consisting of epoxide resins containing various amounts of acetylene. To facilitate inclusion of the carbon black, a 56-percent solution of phenolformaldehyde resins in alcohol and a 45-percent solution of the epoxide resin in acetone were used. Structure studies were done with an electron microscope.

The results show that when the carbon black concentration is increased to 30 percent, the specific resistance decreases markedly. Structural and mechanical properties showed that at a sufficiently high degree of filling, a difference arises in the yield value of carbon-filled resins. This indicates structuration of the carbon black. This was also confirmed with the electron microscope, which showed chain structures of the carbon particles at 30 percent carbon concentration. The phenolformaldehyde resins showed higher conductivity than the epoxide resins for equal carbon black content. This is apparently due to a better compatibility of the phenolformaldehyde resins with the carbon black than that of the epoxide resins.

32. New Methods of Synthesis of Organoelemental High Molecular Compounds

"New Developments in the Synthesis of Organoelemental High Molecular Compounds," by V. V. Korshak, Corresponding Member of the Academy of Sciences USSR; Moscow, Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva, Vol 7, No 2, 1962, pp 122-131

A review on the synthesis and applications of organoelemental high molecular compounds covers methods of synthesis of polymers containing elements of the first, second, third, fourth, fifth, seventh, and eighth groups of the periodic system. Included are compounds containing phosphorus, silicon, iron, germanium, titanium, and zirconium. The bibliography contains 114 references, including 82 of Soviet origin.

33. Pentaerythrite Esters of Antimonous Acid Synthesized

"Pentaerythrite Esters of Antimonous Acids," by Gil'm Kamay and E. P. Mukmanev, Chemical Institute of the Kazan Branch of the Academy of Sciences USSR; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 2845-2848.

The following pentaerythrite esters of antimonous acid were obtained by transesterification: oxmethyl dicycloantimonite and ethylpentaerythrite antimonite and some of their derivatives. The pentaerythrite esters were synthesized for the purpose of studying their possible use as fire-resistant, antimony-containing polymers.

34. Thermoplastic Covers To Protect Machines

"Machine Parts From...Sawdust and Resin"; Baku, Bakinskiy Rabochiy, No 175 (12564), 28 Jul 62, p 4

"The Vilnius Experimental Factory of Fiber Products has produced an experimental lot of coverings for metal-working machines from a thermoplastic made by compressing sawdust with a special resin. The products are notable for their density, lightness, and beautiful appearance.

"The new material was created by specialists of the enterprise. They foresee its application in the production of various machine parts. Thermoplastic costs little, and its wide use will be very economical."

35. Synthetic Materials Being Made From Industrial Scrap

"The Synthetic Materials Industry"; Minsk, Sovetskaya Byelorussia, No 146, 23 Jul 62, p 2

"In Belorussia, the synthetic materials industry has made great progress in using by-products of gas, oil, and peat refining and industrial and agricultural waste. These materials find application of all branches of the national economy, especially in construction. Nylon scraps, for example, are used for the manufacture of gears and other machine parts in the textile and machine-building branches of industry.

"But nylon is not the only material which, in many instances, replaces steel and the valuable nonferrous metals. Experiments conducted in the Belorussian Technological Institute showed that wood pulp, compressed in a special way, is no less dense than the best grade of steel.

"Plastics find broad application in construction. At the end of the current Seven-Year Plan, this republic will produce annually several tens of thousands of cubic meters of polystyrene foam plastic, almost 20 million square meters of polyvinyl chloride linoleum, glass plastics, polystyrene tiles, many polyethylene pipes, and articles for house construction. The synthetic materials industry will develop further by using waste products of oil and natural gas refining."

36. Shepherds To Live in Synthetic Tents

"A Yourta, and What a One!"; by Yu. Berezhnoy; Frunze, Sovetskaya Kirgiziya, No 179 (10259), 31 Jul 62, p 3

"This original house with floor space of 15 square meters weighs, in all, 190 kilograms. It is made for shepherds and is called a 'synthetic yourta.' Why synthetic? Because no matter where you look, everything is plastic: pressed fiberglass which is lighter and denser than steel; elastic paralon; waterproof nylon; and other materials of 'the second nature.'

"The new yourta will replace the old felt one, which, in the course of many centuries, was the indispensable living quarters for shepherds.

"In the spring of the past year, appearing at a conference of leaders in agriculture in Alma-Ata, N. S. Khrushchev said that it is time to look after the mode of life of the shepherds, to create the maximum comforts for their life. 'It is worthwhile to turn to the

scientific-research institutes,' said Nikita Sergeevich. 'Chemistry now produces miracle materials which evidently can easily replace felt. Such a dwelling can be cheaper, more practical, and more comfortable....'

"And here we are at the Mytushchinskiy Combine of Synthetic Construction Products and Materials, 'Stroiplastmass.' Several days ago, the first synthetic yourtas were manufactured here. We had occasion to see how one of them was made.

"First, an open-work frame of light fiberglass tubes was erected. Then an octahedral frame, cone-shaped like a tent, began quickly to be covered with 'walls' and a 'roof.' These are made of paralon, covered on the outside with rubber and on the inside with a snow-white nylon material. Finally, the door was hung, also pressed from fiberglass, and the living quarters, which in the winter protects reliably from the cold and in the summer saves from the heat, was ready. Only one hour was spent by two workers on constructing the yourta, and taking it apart takes even less time.

"It is interesting that none of the materials from which the yourta is made burns or rots and protects well from rain, wind, and sun. This means that the 'house' is practically eternal. It is considered that it costs even less than felt.

"The co-workers of the All-Union Scientific-Research Institute of Plastics, who created this yourta, retained in its construction the traditional "shanrak" -- a wide opening with a canopy beneath the dome -- and provided three windows of unbreakable glass so that the shepherd can see the whole herd. This 'house' is almost twice as light as the usual one; it fits easily into four bags for transportation as a packload.

"G. I. Zokhi, director of the "Stroiplastmass" combine and government prize laureate, relates: 'We have already sent to Kazakhstan herdsmen the first batch of yourtas. At the end of July, we will send 40 more to the same address; and this year, in all, 450. Subsequently, every month, we will put out 80 yourtas. The specialists of the combine are about to visit the shepherds: on the spot, it is more evident how our product is "making itself at home."'"

## Radiation Chemistry and Reactor Technology

37. Plutonium Reactor Recirculation Problems

"Recirculation Calculations of Reactor Systems Using Plutonium Fission," by M. F. Nagiyev, V. D. Kandalova, and A. S. Kengerli, Institute of Petrochemical Processes; Baku, Doklady Akademii Nauk Azerbaydzhan SSR, Vol 18, No 1, 1962, pp 17-21

"The possibility of using the vast resources of nuclear energy has uncovered new and broad prospects for the development of science and engineering. Modern-day nuclear power is based on the fission of heavy elements by neutron capture. Consequently, these nuclear reactions are now more important in a practical sense.

"Nuclear fission of plutonium or uranium nuclei in an atomic reactor releases an enormous amount of energy which is transferred by fission products, neutrons, electrons, and gamma-quanta. Declaration of these particles creates heat in the central part of the reactor.

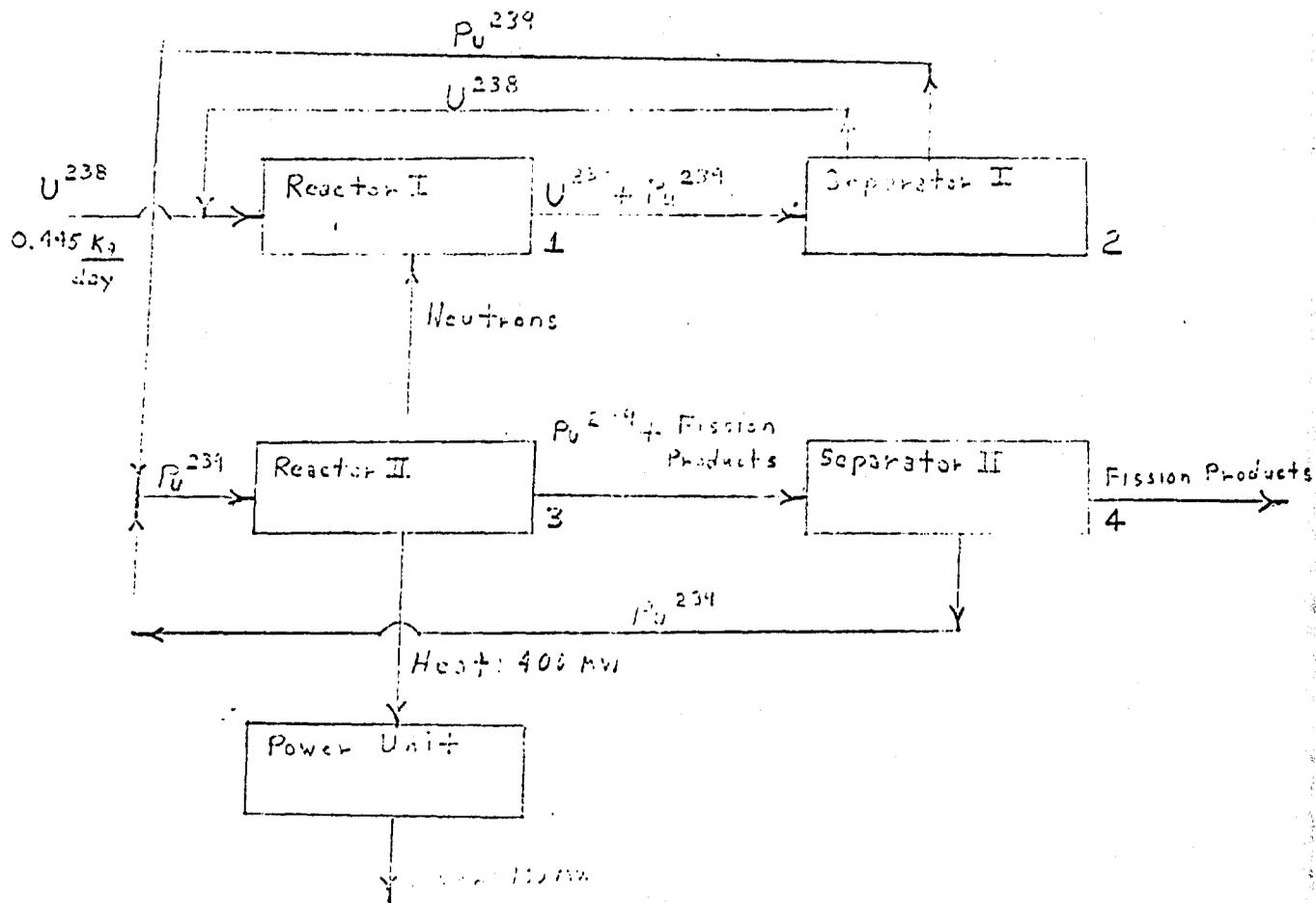
"This heat can be used to boil water or other suitable liquids, and the steam obtained can be used to run turbines and generators.

"It is known at the present time that uranium isotopes  $U^{235}$ ,  $U^{238}$ , and  $U^{233}$  and the plutonium isotope  $Pu^{239}$  have practical use as nuclear fuel.  $U^{235}$ ,  $U^{239}$  undergo fission on capture of slow neutrons; and  $U^{238}$ , of fast neutrons.

"Fast neutrons are calculated to have a minimum energy of one million electron volts. Energy of slow or thermal neutrons is comparable to the heat of motion of various atoms and is a fraction of an electron volt. Nuclear fission by thermal neutrons is much more effective than by fast neutrons.

"Natural uranium consists mainly of  $U^{238}$  and small quantities of  $U^{235}$  (0.72%). Natural uranium enriched with 5-10%  $U^{235}$  is used in atomic reactors since, under the action of slow neutrons, only  $U^{235}$  undergoes nuclear fission and the  $U^{238}$  is not affected.  $Pu^{239}$  also undergoes fission with slow neutrons and can also be used as nuclear fuel.  $Pu^{239}$  is obtained from  $U^{238}$  by the adsorption of slow neutrons. During the adsorption of thermal neutrons,  $U^{238}$  is converted to  $U^{239}$ , which, as a result of two self-initiating beta decompositions, forms  $Np^{239}$  and, subsequently,  $Pu^{239}$ .

"The reactor system for plutonium fission is shown below (Figure 1):



"U<sup>238</sup> is used as a raw material in reactor I, where the U<sup>238</sup> atoms adsorb slow neutrons and form Pu<sup>239</sup>. All of the products of reactor I are fed to separator I, where the Pu<sup>239</sup> is separated from the unreacted U<sup>238</sup> and sent to reactor II. Here, Pu<sup>239</sup> atoms undergo fission by the thermal neutrons, which liberates a large amount of energy and forms neutrons and fission products. The thermal energy is converted to electrical energy in the power unit.

"Part of the product neutrons from reactor II are returned to reactor I to be adsorbed by the U<sup>238</sup> atoms, and the other neutrons are used in reactor II for further nuclear fission. The unreacted Pu<sup>239</sup> and fission products are sent to separator II, where Pu<sup>239</sup> is separated and recirculated to reactor II. The fission products from separator II are highly radioactive and are taken from the system and used in the national economy.

"Data for the product yield of each stage of the process are shown in the table below.

"The amount of fresh U<sup>238</sup> put into reactor I of each unit is 0.445 kg/day.

"Mathematical methods based on the theory of recirculated processes are used for calculation of the above-described system.

Product Yield for Each Stage of the Process

Unit	Product Yield in Weight Fraction: $\alpha$ -- recirculated, $\beta$ -- withdrawn
Reactor I	= 0.99
Uranium-238	$\alpha_{12A_2} = 0.99$
Plutonium-239	$\alpha_{12B_2} = 0.01$
	<u>1.00</u>
Reactor II	
Uranium-238	$\alpha_{23A_3} = 0.99$
Plutonium-239	$\alpha_{23B_3} = 0.01$
	<u>1.00</u>
Reactor III	
Uranium-238	$\alpha_{34A_4} = 0.979912$
Low enriched uranium product	$\alpha_{34B_4} = 0.000090$
Plutonium-239	$\alpha_{34C_4} = 0.019998$
	<u>1.000000</u>
Reactor IV	
Plutonium-239	$\alpha_{45B_5} = 0.98$
Low enriched uranium product	$\alpha_{45C_5} = 0.02$
	<u>1.00</u>

"A flow diagram for the system is given in Figure 2.

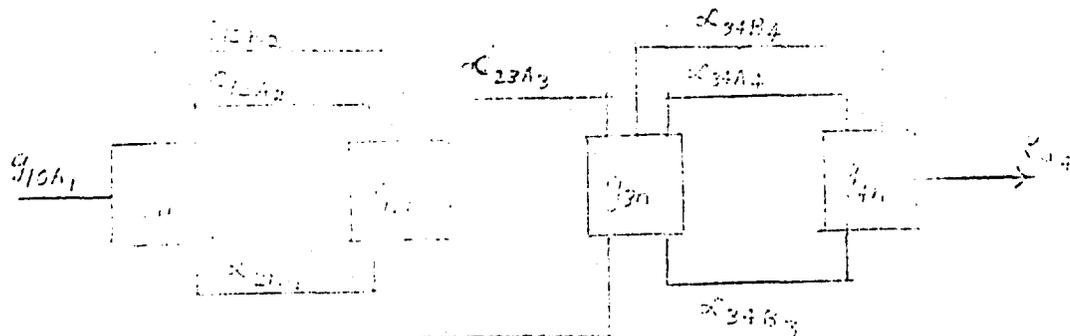


Fig 2

$$g_{1n} = g_{10A_1} + \alpha_{21B_1} \cdot g_{2n} + \alpha_{31C_1} \cdot g_{3n}$$

$$g_{2n} = \alpha_{12A_2} \cdot g_{1n} + \alpha_{12B_2} \cdot g_{1n}$$

$$g_{3n} = \alpha_{23A_3} \cdot g_{2n} + \alpha_{23B_3} \cdot g_{2n}$$

$$g_{4n} = \alpha_{34A_4} \cdot g_{3n} + \alpha_{34B_4} \cdot g_{3n}$$

where  $g_{1n}$  -total load of reactor I

$g_{2n}$  -total load of separator I

$g_{3n}$  -total load of reactor II

$g_{4n}$  -total load of separator II

$g_{10A_1}$  -fresh load of  $U^{238}$  (kg/day) in reactor I

$\alpha_{21B_1}$  -weight fraction of  $U^{238}$  from separator I returned to reactor I

$\alpha_{31C_1}$  -weight fraction of neutron flux from reactor II to reactor I

$\alpha_{12A_2}, \alpha_{12B_2}$  -weight fraction of  $U^{238}$  and  $Pu^{239}$  going from reactor I to separator I

$\alpha_{23A_3}$  -weight fraction of  $Pu^{239}$  going from separator I to reactor II

$\alpha_{34A_4}, \alpha_{34B_4}$  -weight fraction of  $Pu^{239}$  fission products going from reactor II to separator II

$\alpha_{23B_3}$  -weight fraction of  $Pu^{239}$  from separator II returned to reactor II

$P_{a4}$  -yield products of decomposition per batch

$P_{Ra4}$  -yield products of decomposition in the recirculated process

$K_{R4}$  -recirculation coefficient of the apparatus from which decomposition products are withdrawn

$i$  -A, B, C--components

$\gamma$  -1, 2, 3, 4--apparatus

"Substituting the values of  $F_{WV}i_v$  and  $f_{10A}$  into the material balance equations and solving them in order permit the load of each apparatus to be determined in kg/day:

$$\begin{aligned} f_{10A} &= 1.7 \\ f_{20A} &= 1.1 \\ f_{30A} &= 0.5 \\ f_{40A} &= 0.049 \end{aligned}$$

"The coefficient of recirculation,  $K_2$ , is determined only for the apparatus from which fission products are withdrawn and is the ratio of the total reactor load to the fresh  $W^{230}$  load.

$$K_{K_2} = \frac{f_{20A}}{f_{10A}} = \frac{1.1}{0.5} = 2.2$$

"In this case  $f_{10A}$  is equal to the value of  $K_2$  from above  $f_{10A}$  is:

$$f_{10A} = P_{10A} \cdot K_2 = 0.5 \cdot 2.2 = 1.1$$

"Material balance for the system is:

$$\begin{aligned} \text{(raw material): } & 0.115 \text{ kg/day} \\ \text{(fission products) } & P_{10A} \cdot f_{10A} = 1.05 \cdot 0.115 = 0.12075 \text{ kg/day} \end{aligned}$$

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38. Sorption of Fission Products by Ion Exchange

"Sorption of Long-Life Fission Products by Soils and Clayey Minerals. III. Selectivity of Soils and Clays in Respect to  $\text{Sr}^{90}$  Under Various Conditions," by Yu. A. Kokotov, and R. F. Popova; Leningrad, Radiokhimiya, Vol 4, No 3, 1962, pp 328-334

Data are presented on the relationship of the  $\text{Sr}^{90}$  distribution coefficient in soils to the pH when various ions are present. Complete correlation is lacking between the  $\text{Sr}^{90}$  distribution coefficient and the ion exchange capacity of the soil. Also, full correlation on the change in distribution coefficient on dilution of the soil suspension is lacking. This is apparently due to the change in amount of macrocomponent (calcium ion) in the system at constant ion exchange capacity. An increase in the amount of macrocomponent in the system causes a decrease in the maximum on a plot of the  $\text{Sr}^{90}$  distribution coefficient against pH and also causes a shift toward higher pH values. Analogous changes take place on substituting any macrocomponent by the next succeeding one in the following series:  $\text{Na}^+$ ,  $\text{Mg}^+$ ,  $\text{Ca}^+$ ,  $\text{Sr}^+$ ,  $\text{Ba}^+$ . Variations in curves obtained by plotting  $\text{Sr}^{90}$  distribution coefficients against pH for various soils of the USSR are due primarily to the varying content of the macrocomponent (calcium ion) in the soils.

Data presented in this work make it possible to select a set of conditions for any soil under which the given soil will display maximum selectivity in respect to micro quantities of  $\text{Sr}^{90}$ . It is also possible to select optimum sorbents for  $\text{Sr}^{90}$  from soils and clays.

39. Isotope Radiometry of the Cerium Group

"A Radiometric Method of Determining the Isotopic Compositions of Cerium Separated From the Products of Heavy Nuclear Fission," by S. V. Belov, R. V. Zhelezkov, N. T. Polyakov, and N. V. Sidorov; Leningrad, Radiokhimiya, Vol 4, No 3, 1962, pp 334-340

A radiometric method is presented for the quantitative determination of isotopes in the cerium group whereby the activities of  $\text{Ce}^{141}$ ,  $\text{Ce}^{143}$ , and  $\text{Ce}^{144} \longrightarrow \text{Pr}^{144}$  can be determined with a single measurement on gamma and beta spectrometers. The activity of  $\text{Pr}^{143}$ , when present in a mixture, can be found either by measuring the accumulation of  $\text{Ce}^{143}$  or by calculation from the total activities of  $\text{Ce}^{141}$ ,  $\text{Ce}^{143}$ , and  $\text{Ce}^{144} \longrightarrow \text{Pr}^{144}$  as measured on a 4-pi counter. Experimental error in determining isotope activity was not greater than  $\pm 10\%$ .

40. Extraction of Thorium Isotopes From Monazite

"Study of the Kinetics of Reaching Adsorption Equilibrium When Leaching With Radioactive Indicators," by I. Ya, Starik and K. F. Lezarev; Leningrad, Radiokhimiya, Vol 1, No 3, 1962, pp 322-328

A study of the kinetics of the extraction of thorium from monazite showed that the time required to establish equilibrium between the mineral surface and the solution and to mix fully the indicator atoms with the extracted element depends strongly on the H<sup>+</sup>-ion concentration in the solution and is determined chiefly by the solution rate of the thorium hydrolysis product, located in the capillaries of the monazite.

Results showed that when leaching monazite in 0.07N H<sub>2</sub>SO<sub>4</sub>, 0.23N, or 1.1N HCl, the time for establishing equilibrium between the mineral surface and the solution is 8, 3, and one hour, respectively.

41. Separation of Tellurium From a CsCl Target

"Separation of Tellurium Without Carrier From a CsCl Target Irradiated With Protons Having an Energy of 660 Mev," by V. N. Bybakov, Van Chuan'-Pen, and Min Nam Buk; Leningrad, Radiokhimiya, Vol 4, No 3, 1962, pp 340-345

This work involved the development of a method for separating small weighable quantities of selenium and tellurium on a strongly basic ASD-2 anion exchange resin, which was carried out by bombarding a one-gram CsCl target with high-energy protons (660 Mev). For preparation of the target, sorption of tellurium without a carrier on the surface of a silver disk was recommended.

42. Extraction of Technetium-99 Studied

"Extraction of Technetium-99 From Aqueous Solutions With Quinoline, Tributyl Phosphate, and Some Other Organic Solvents," by Academician V. I. Spitsyn, A. F. Kuvina, N. N. Zamoshnikova, and T. S. Tagil', Institute of Physical Chemistry, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 144, No 5, 11 Jun 62, pp 1066-1068

According to published literature, technetium -90 may be extracted from acid, neutral, and alkaline media, but it is not possible to select the optimum extractant suitable for practical purposes. Therefore, the extraction of technetium was studied with quinoline, tributyl phosphate, acetone, acetyl acetone, trifluoroacetone in benzene, and triphenylguanidinium chloride in a n-butyl alcohol. In the present work, data are presented only on extraction with quinoline and with tributylphosphate.

Optimum conditions for extraction with quinoline consist mainly of maintaining the correct pH. Although technetium may be separated from quinoline by evaporation under vacuum, this method is not suitable owing to the presence of decomposition products. However, if a nonpolar solvent such as chloroform is added, technetium is transferred almost completely (99.7 percent) to the aqueous phase.

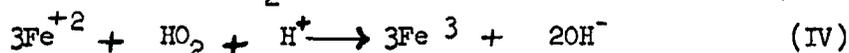
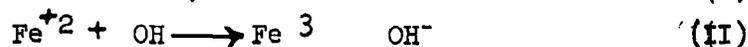
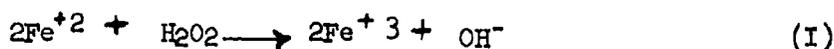
Tributylphosphate may be used to extract technetium in the presence of 0.5N nitric acid. The technetium is re-extracted from the tributylphosphate with 10-12N nitric acid.

#### 43. Kinetic Equation for Radiation Yields Derived

"The Applicability of Equations of Homogeneous Kinetics to Radiolysis at High Radiation Intensities," by B. V. Ershler and V. M. Byakov; Moscow, Doklady Akademi Nauk SSSR, Vol 144, No 5, 11 Jun 62, pp 1103-1104

"Radiolysis with soft and hard gamma-quanta and fast electrons during energy absorption of the  $10^{13} - 10^{16}$  ev/cu. cm. sec. is well described by equations of homogeneous chemical kinetics. This is proved by the presence of the  $I_2^1$  rule at these intensities and by good agreement of much data on radiolysis kinetics with theoretical calculations based on Allen's simplified model. In the latter, the diffusion of radicals is neglected, i.e., it is assumed that during irradiation of water, the particles H, OH,  $H_2$ , and  $H_2O_2$  are formed according to the equation  $(2k+n)H_2O = (2l+m)H_2O = kH_2 + lH_2O_2 + mOH + nl$ , where k, l, m, n represent the quantities of the corresponding particles generated from water per 100 ev of absorbed energy.

In describing reactions of these particles with dissolved substances and with each other, their concentrations are considered uniform throughout the solution. We shall attempt to illustrate that such a simplified model correctly describes the radiolysis kinetics at the very high radiation intensities that are used in the interesting works of A. K. Pikayev and P. Ya. Glazunov. In the latter, a solution of ferrous sulfate in water saturated with air was irradiated with fast electrons, whereby the intensity I of absorbed energy reached  $10^{23}$  ev/cu cm sec. It is known that under ordinary intensities of irradiation the oxidation yield of such a solution  $G_{max} = 15.6$  ions of iron per 100 ev, where  $15.6 = 2l + m + 3n$ . This relationship is obtained from the fact that all radicals oxidize iron by reactions which may be summed up as follows:



"The OH acceptor in the ferrous sulfate and oxygen solution is the  $\text{Fe}^{+2}$  ion having a concentration of  $1-2 \times 10^{-3}$  N or higher, while the acceptor for the H ions is the oxygen molecule having a concentration (in the air-saturated solution) of one order less. As the intensity of irradiation increases, the concentrations of all primary radiolysis products in the bulk portion increase, and, therefore, the following radical recombination reactions occurring in the bulk also increased in velocity:



"This bulk recombination of radicals with which it is possible for reactions (II) and (III) to compete should be distinguished from recombination in the track, which leads to the formation of both "primary" molecules  $\text{H}_2$  and  $\text{H}_2\text{O}_2$ ; reactions (II) and (III) are not capable of competing with the latter. This helps to explain the independence of the yields of k, l, m, and n from the concentrations of the acceptors. The bulk recombination of radicals is accelerated with the square of their bulk concentration, but the capture of radicals by acceptors accelerates only with the first degree of the bulk concentration. Therefore, as the intensity of irradiation is increased in solutions of ferrous sulfate in oxygen, recombination in bulk begins to compete with capture, and the yield of ferric oxide decreases.

"Apparently, only reactions (V) and (VI) can lower the yield, not (VII). In this case, reaction (V) would be more effective in a conventional dosimetric solution because the concentration of  $\text{Fe}^{+2}$  is greater than the concentration of oxygen, and reaction (II) is faster than reaction (III). Taking note of reactions (I) - (V), we obtain, by the method of stationary constants, the following equation for the relationship between the yield of iron oxidation G to the intensity of radiation:

$$K_3/K_5^{\frac{1}{2}} = \left( \frac{I}{l_{\text{Oon}}} \right)^{\frac{1}{2}} \frac{n - 1/3 (G_{\text{max}} - G)}{l/6 (G_{\text{max}} - G)^{\frac{1}{2}}} \cdot \frac{1}{(\text{O}_2)} \quad (1)$$

where  $k$ ,  $l$ ,  $m$ ,  $n$  represent the quantities of the corresponding particles generated from water per 100 ev of absorbed energy.

"In describing reactions of these particles with dissolved substances and with each other, their concentrations are considered uniform throughout the solution. We shall attempt to illustrate that such a simplified model correctly describes the radiolysis kinetics at the very high radiation intensities that are used in the interesting works of A. K. Pikayev and P. Ya. Glazunov. In the latter, a solution of ferrous sulfate in water in favor of using equations of homogeneous kinetics in radiolysis at high intensities of irradiation. It would be very desirable to continue research at high intensities of irradiation for the purpose of exact measurement of kinetic constants for recombination reactions and to distinguish the limits of applicability of equations of homogeneous kinetics in radiolysis. The possibility of lowering the oxidation yields because of overshadowing of tracks at high intensities will be considered elsewhere by us."

#### 44. Synthesis of Chromium Hexacarbamide From Uranooxalic Acid

"The Question of New Salts of Uranooxalic Acid," by A. A. Grinberg, G. I. Petrzhak, and G. S. Lozhkina; Leningrad, Radiokhimiya, No 3, 1962, pp 289-295

It has been proven that tetravalent uranium can be oxidized by trivalent salts. The present work was based on utilizing this principle in an attempt to synthesize complex uranooxalates with complex cobalt and chromium cations.

The synthesis of chromium hexacarbamide, a new compound, with the composition  $\left[Cr(N_2H_4CO)_6\right]_4\left[U(C_2O_4)_4\right]_3 \cdot 11H_2O$  was successful. This compound is stable in air. An attempt to synthesize a complex cobalt compound was unsuccessful because of oxidation-reduction interaction between the components which yields an unstable product.

Rare Metals45. Decomposition of Americium Oxalate

"A Study of the Decomposition of Americium Oxalate Under the Action of Its Own Alpha-Radiation," by I. A. Lebedev, S. V. Pirozhkov, V. M. Razbitnoy, and G. N. Yakovlev; Leningrad, Radiokhimiya, Vol 4, No 3, 1962, pp 308-312

Experiments showed that the oxalate of trivalent americium decomposes with time under the action of its own alpha-radiation and transforms into a carbonate. The decomposition goes to completion within 15-20 days, and within 50-60 days the product has the formula  $Am_2(CO_3)_3 \cdot 5H_2O$ . The decomposition of this oxalate is a first order reaction with a rate constant of  $0.22 \pm 0.04 \text{ days}^{-1}$ . During the decomposition a gas is liberated which consists of a mixture of CO and CO<sub>2</sub>, with CO<sub>2</sub> predominating.

46. Formation of Complex Lanthanide Nitrates

"Complex Compounds of Lanthanide Nitrates With Nitric Acid," by Ye. Ye. Kriss and A. A. Sheka; Leningrad, Radiokhimiya, Vol 4, No 3, 1962, pp 312-322

Complex formation in the system metallic nitrate-nitric acid was studied by electric transference and ion exchange methods on a series of trivalent lanthanides. It was shown that cationic, anionic, and electrically neutral complexes are formed and that the composition, stability, and concentration are dependent on the nitric acid and lanthanide content in solution and also on the atomic number of the element involved.

In a 1-1.5M HNO<sub>3</sub> solution, the cationic form of the lanthanide is prevalent. In the 3-4M range, the complexes are primarily neutral, and at higher concentrations (up to 7M) elements of the cerium group form anion complexes and elements of the ytterbium group remain in the form of electrically neutral complexes. Rate constants for the formation of lanthanum and ytterbium cation complexes were determined.

47. Detection of Neptunium With the Use of Quercetin

"Photometric Determination of Neptunium With the Use of Quercetin," by E. G. Chudinov and G. N. Yakovlev; Leningrad, Radiokhimiya, Vol 4, No 3, 1962, pp 373-375

Spectrophotometric and radiometric methods of detecting neptunium-237 are difficult to use at low concentrations of neptunium in complex mixtures. This brought about the necessity of finding a new method using reagents

which form colored complex compounds. One such reagent is quercetin (3,5,7,3',4'-pentaoxyflavin).

Neptunium and quercetin in a water-ethanol solution form a yellow-green complex with a maximum absorption at 425 millimicrons. If the quercetin solution is added to an acidic water-ethanol solution of neptunium, the optical density of the complex at 425 millimicrons is characterized by a sharp peak at a pH of 1.6. If the neptunium solution is added to a water-ethanol quercetin solution, there is little dependence of the optical density on the pH in the 3.0-7.0 range. The molar absorption coefficient for neptunium compounds at the two given conditions have values of 14,600 and 23,000, respectively.

#### 48. Detection of Neptunium With Thoron

"A Photometric Determination of Neptunium With the Use of Thoron," by E. G. Chudinov and G. N. Yakovlev; Leningrad, Radiokhimiya, Vol 4, No 3, 1962, pp 375-377

The photometric method for detecting neptunium with the use of quercetin is adequate but requires careful purification of the neptunium from impurities. This present work was conducted to develop a method of detecting neptunium with the use of thoron (benzene-2-arsenous acid/-(1-azo-1)-2-oxynaphthalene-3,6-disulphonic acid), known as one of the most selective reagents for thorium. In using thoron to determine neptunium, the neptunium is first separated from impurities in the mixture by extraction with tri-isooctyl-amine. It was established that tetravalent neptunium forms a pink-colored complex when mixed with thoron which has a absorption maximum at 545 milli-microns.

Several other methods of purifying neptunium in the presence of large quantities of uranium, plutonium, iron, or other elements are described.

#### 49. Reactions of Germanium With Chloranilic Acid

"Complex Compounds of Germanium With Chloranilic Acid," by V. A. Nazarenko and G. V. Flyantikova, Institute of General and Inorganic Chemistry, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 10, Oct 62, pp 2335-2339

Reactions of germanium and chloranilic acid were studied, and it was found that germanium in acid solution forms three complexes:  $GeA$ ,  $GeA_2$ , and  $GeA_3$ , where A represents the cation addend. From studies of the influence of change in  $H^+$  concentration, it was established that in the formation of chloranil complexes the  $Ge^{+4}$  ion replaces one  $H^+$  ion, i.e., the chloranilic acid reacts as ortho-oxyquinone. Dissociation constants were calculated for all the complexes.

50. Extraction of Microquantities of Cerium

"Extraction of Microquantities of Cerium From Nitric Acid Solutions With Di- and Monoisoamyl Esters of Methylphosphonic Acid," by Ye. V. Ukraintsev and N. F. Kashcheyev [deceased]; Leningrad, Radiokhimiya, Vol 4, No 3, 1962, pp 279-289

The primary purpose of this work was to explain the mechanism involved in the extraction of trivalent cerium from nitric acid solutions with DAMFK (diisoamyl ester of methylphosphonic acid) and MAMFK (monoisoamylester of methylphosphonic acid). Reaction rate constants for complex formation were determined for the various diluents used and found to be  $62 \pm 1.5$  for kerosene and  $12 \pm 3$  for benzene and xylene at constant ionic strength and solvate number. The thermodynamic constant for benzene was estimated to be somewhere between 30 and 40.

The mechanism for the extraction of cerium with MAMFK was proposed to be the formation of the  $Ce(NO_3)(MAMFK^{-1})_2 \cdot (MAMFK)_2$  complex, and its rate constant was calculated to be  $0.126 \pm 0.002$ .

The concentration of nitric acid, thorium nitrate, and the nitrate ion in the aqueous phase and their influence on the distribution of cerium was observed, and it was noted that the distribution coefficient for cerium drops sharply in the presence of thorium nitrate. It was also shown that the presence of MAMFK and DAMFK increases the extraction of cerium probably as a result of a synergistic effect. At low acidity, this effect is quite significant.

51. Reactions of Gallium Phosphate With Phosphoric Acid

"Reactions of Gallium Phosphate With Phosphoric Acid," by I. V. Tananayev and N. N. Chudinov, Institute of General and Inorganic Chemistry Imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 10, Oct 62, pp 2285-2289

Solubility of the  $GaPO_4-H_3PO_4-H_2O$  system in various concentrations of  $H_3PO_4$  was studied at  $25^\circ$  and  $75^\circ$  C. It was established that two solid phases exist: a neutral gallium phosphate ( $GaPO_4 \cdot 2H_2O$  at 35%  $H_3PO_4$ ) and an acid phosphate ( $GaPO_4 \cdot H_3PO_4 \cdot 3H_2O$  at 35-75%  $H_3PO_4$ ). Both compounds were obtained for the first time.

It was shown that at  $25^\circ$  C the solubility of gallium phosphate in dilute  $H_3PO_4$  (up to 17%  $H_3PO_4$ ) is approximately half its solubility at  $75^\circ$  C.

Comparison with known data placed gallium in the following order of decreasing solubility in dilute  $H_3PO_4$  for trivalent metal phosphates:  $Al > Fe > Ga > Gd$  at  $25^\circ$  C and  $Cr > Al > In > Ga > Fe$  at  $70-80^\circ$  C.

52. Compounds in the Niobium-Salicylate-Organic Base System

"Formation of Complexes in the Niobium-Salicylate-Organic Base System," by A.K. Babko and A. I. Volkova, Institute of General and Inorganic Chemistry, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 10, Oct 62, pp 2345-2351

The physical and chemical properties and conditions for the formation of the yellow niobium salicylate complex were studied. At a pH of 3, a complex ion with a Nb:Sal ratio of 1:2 is formed and the equilibrium constant for the formation at pH 4 is  $2.5 \times 10^{-23}$ .

In this system, ternary complex compounds are formed and extracted with chloroform. Organic bases studied in the work were: pyridine, quinoline, pyrimidin, antipyrine, diantipyrine, quinine, codeine, urotropine, triethylamine, and tetralin. Formation of the ternary complexes depends mainly on the pH and concentration of the reacting components. Optimum conditions were found to be at pH 2-3. In more acidic media, stability of the complex depends on the organic base.

The absorption spectrum for the chloroform extract of the niobium ternary complex is characterized by two bands; salicylic acid at a wavelength of 315 millimicrons, and niobium at 350 millimicrons.

Miscellaneous53. Soviet Chemist Holds That Biosynthesis in Outer Space Is Unlikely

"Cosmic Poles of Life"; Moscow, Komsomol'skaya Pravda, No 162 (11406), 14 Jul 62, p 4

The well-known Soviet chemist I. L. Knunyants was asked to comment on an article appearing in the French journal Science et Vie. The authors of this article advance a theory that it is possible for life to be generated in outer space. This theory is supported by experiments in which a mixture of methane, ammonia, and water is cooled to  $-230^{\circ}\text{C}$  and then bombarded with protons from a special accelerator. After 200 seconds, urea, acetamide, and acetone were detected in the mixture. It was proposed that cosmic radiation acts directly on atoms found in space, thus causing them to form molecules including amino acids. These frozen amino acids fall on a planet having water and a sufficiently warm climate so that the amino acids may be converted into complex organic compounds.

Academician I.L. Knunyants, in commenting on this article, does not believe that outer space can be a source of life on other planets. He states that the quantity of elements necessary to form organic molecules

in space is extremely small. Second, it is highly improbable that three molecules of methane, ammonia, and oxygen could be formed simultaneously in outer space.

Kuunyants goes on to state that the problem now standing before biochemists studying the history of the origin of life is cell formation. If the genesis of living cells could be figured out, it would be possible to create them artificially.

#### 54. New Dust-Repellent Paint

"A New Paint," by A. Neyman; Moscow, Moskovskaya Pravda, No 182 (12927), 5 Aug 62, 4

"Few people realize that ordinary city dust carries an electrical charge. Scientists established that this charge is always positive.

"On the other hand, the majority of paints and coating materials used in construction are either charged negatively or have no charge at all.

"Since unlike charges attract, the positive dust particles are attracted to the negative walls.

"Of all construction materials, marbel alone has a charge that is the same as that of dust particles.

"Workers at the Laboratory of Varnishes and Paints of the All-Union Scientific-Research Institute for New Construction Materials decided to make use of this marbel-like property. Under the direction of Candidate of Chemical Sciences A. I. Karasev, paints were developed at the institute which have positive charges and dust-repellent properties. Such cheap paints will now be used to coat building facades and the interior walls of living quarters.

"Recently, the positive paint was used to coat one of the buildings in the Khoroshy-Mnevnik Apartment House."

#### 55. Phase Equilibria in the Sodium Borohydride-Ammonia System

"Phase Equilibria in the  $\text{NaBH}_4\text{-NH}_3$  System," by G. A. Yegorenko, Ya. I. Vabel', and I. S. Antonov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 10, Oct 62, pp 2419-2425

Phase equilibria in the system  $\text{NaBH}_4\text{-NH}_3$  was investigated in the temperature range  $-49.8^\circ$  to  $25.0^\circ\text{C}$  at pressures up to 900 mm Hg. It was established that sodium borohydride forms two compounds with ammonia --  $\text{NaBH}_4 \cdot 3\text{NH}_3$  and  $\text{NaBH}_4 \cdot 4.5\text{NH}_3$  -- which decompose at  $-16.0^\circ$  and  $-20.5^\circ\text{C}$ , respectively.

An empirical equation is given for the vapor tension of ammonia for various compositions of the system being studied; also heats of vaporization for ammonia and change in enthalpy for the formation of the two compounds mentioned above were calculated.

56. Combustion of Ammonium Perchlorate Studied

"The Combustion of Ammonium Perchlorate," by L.D. Romodanova and V.I. Roshchupkin, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 36, No 7, Jul 62, pp 1554-1555

A study was made of the thermal decomposition of ammonium perchlorate at 2-4 mm of mercury pressure and combustion at pressures up to 150 kg/cm<sup>2</sup>. It was found that the minimum pressure at which stable combustion takes place increases with decreasing particle size of a sample. As the density of the ammonium perchlorate is increased, the minimum pressure decreases. The presence of up to 0.7 percent moisture in ammonium perchlorate pellets has no effect on the minimum pressure for combustion. The speed of ammonium perchlorate combustion at 150 kg/cm<sup>2</sup> seems to have a constant value.

57. Design and Construction of Chemical Reactors

"Concerning the Design and Scaled Construction of Chemical Reactors for Exothermic Processes," by N. I. Gel'perin and V. B. Kvasha; Leningrad, Zhurnal Prikladnoy Khimii, Vol 35, No 8, Aug 62, pp 1728-1732

The purpose of the present work was the study of the mechanism of mass transfer in a fractionating condensation system and the scaled construction of chemical reactors which permit uniform conversion along the length of the working zone.

Tests were made using a glass column, 89 mm in diameter and 2 meters in length, with an internal heating element, on benzene-toluene and water-methanol binary solutions.

Kinetic equations derived from experimental data and the use of Nusselt, Reynold, and Prandtl numbers were subsequently used to determine the amount of catalyst required for the reactions, degree of conversion, heat transfer, reaction rate, etc.

58. Ozone Used To Purify Water

"Birth of 'Blue' Water," by Yu. Sinyakov; Moscow, Moskovskaya Pravda, No 159, 8 Jul 62, p 3

The article discusses the use of ozone to purify water. Water is presently purified in the Soviet Union by using chlorine -- to destroy and bleach the yellow-green slime--and aluminum sulfate--to precipitate the solid impurities.

The ozone process, though still not in general use, is simpler and should be cheaper than the old method, according to Georgiy Pavlovich Kudryashov, chief engineer of the Northern Water Supply Plant. The ozonator operates by sending an electric charge through pipes filled with oxygen. The ozone produced goes down to the mixing chamber where it purifies and bleaches the water and improves its taste.

59. Distillation Apparatus Increases Turkmen's Supply of Drinking Water

"The Sun Distills Water"; Alm Ata, Kazakhstanskaya Pravda, No 169, 20 July 62, p 3

A simple and originally constructed distillation apparatus was erected at the Kata-Kumov well. During the day, a low tank with a slanting glass top and insulated sides and bottom acts as a reservoir. The salt water which pours into it from the well evaporates in the sun. The steam, touching the glass, turns into drops of distilled water which trickle through a trough into a special container. The 10-square-meter glass top of the apparatus yields 50 liters of water per day. Diluted with water from the well, it is used by animals as drinking water, and water no longer must be hauled from a distance.

The apparatus was designed and built by scientific workers of the Physicotechnical Institute of the Academy of Sciences Turkmen SSR.

Turkmen scientists are successfully exploiting solar energy, especially to distill water -- a very important achievement because 60% of Turkmen's pasture-land water is bitterly salty.

In answer to a request by the director of the "Chemen-abid" Sovnarkhoz, scientists are making estimates for building a large distillation apparatus in the Ellibir area, a rich pasture region. The apparatus will operate all year-round and provide water for 7,000 sheep.

An industrial distillation unit will be built at the "Karabogazsul' Fat" Combine.

60. Armenian Scientists Develop Acid- and Alkaline-Resistant Glass Fiber

"Fiber From Mountain Rocks"; Sovetskaya Kirgiziya, No 153, 30 Jul 62, p 4

"Chemists of Armenia have developed scientific methods for obtaining glass fiber from most of the republic's mountain rocks. The new method produces nonalkaline glass from tuff, pumice, perlite, volcanic glass, and other related stones of volcanic origin, supplies of which are practically inexhaustible in Armenia.

"Glass fiber from mountain rocks is distinguished for its high physical-chemical properties. It is immune to the action of acids and alkalis."

61. Armenian Industry Makes Useful Products From Stone

"Thread From...Stone," by M. Kulidzhanyan; Dushanbe, Kommunist Tadzhikistana, No 186 (9624), 10 Aug 62, p 2

"Before the establishment of Soviet power in Armenia, stone alone formed the dismal landscape of our country and was the cause of the poverty and suffering of the people. Now this 'accursed stone' is serving the Soviet people well. Thus, the famous arctic tuff, many-colored marble, and shining onyx all entered into architectural design and into the trimming of the stations of the Moscow subway (the greatest in the world) and of the skyscrapers of the capital of our country and are widely used in construction.

"In the laboratory of the Institute of Chemistry of the Armenian Sovnarkhoz, bundles of many-colored fibers attract attention.

"These fibers are seven times stronger than silk and ten times more dense than woolen yarn," says the director of the institute, M. Manvelyan. "They do not face and are not damaged by temperatures even of 300 degrees centigrade."

"In the laboratory, the thread is made from stones. And this is not all. Only a limited assortment of products is produced from wool and cotton, while from fiberglass thousands of different articles can be produced which will be useful in the most various branches of the economy.

"Fiber made from stone is useful for the facing of chairs, arm-chairs, and tables. Cheap, strong, and beautiful windowframes, doors, and partitions can all be made from it. Fiberglass, which is five times lighter than iron and almost as strong, will replace metal in ferroconcrete and will be used in construction. From the stone of the hearth of Armenia glass plates are already being prepared in the laboratories of the Institute of Chemistry.

"Tuff, felsite, basalt, and other stones of volcanic origin are not only being used for construction, but also find application in many branches of the national economy.

"A rough gray rock with black speckles -- nepheline syenite -- is deposited in large quantities in the mountains of Razdan. Toward the end of the Seven-Year Plan, a giant of the chemical industry will grow up here -- the Razdan Chemical-Mining Combine.

"Comrade M. Manvelyan presented a general and very economic method of complex treatment of low-grade nepheline ore by chemical concentration. The essence of this method is that the pulverized nepheline rocks are treated in an alkaline bath.

"For testing the method of chemical concentration under industrial conditions, an experimental plant was set up at the Scientific-Research Institute of Chemistry of the Armenian Sovnarkhoz, with a progressive technology in obtaining from nepheline syenite valuable chemical products."

62. Conference Discusses Developments in Consumer-Goods Chemistry

"Manufactured Goods Improving Our Existence," by V. Naumenko; Vilnius, Sovetskaya Litva, No 226 (5867), 25 Sep 62, p 1

"Yesterday, in connection with the opening in Vilnius of the interrepublic conference on the development of consumer-goods chemistry, an unusual exhibition began work in the new building of the engineering house of the Lithuanian Sovnarkhoz. Representatives of enterprises and scientific-research institutes of Lithuania, Latvia, Estonia, and Belorussia demonstrated the innovations of consumer-goods chemistry.

"A large group of people are near the stand of the Lithuanian Sovnarkhoz. Specialists from brother republics are attentively examining the exhibits of the Vilnius factory Gintaras. Many of them approvingly speak about the quality of the new bleaching process for the washing of linen, under the name of Zhuvedra. Recently the specialists of this concern mastered the production of nitroglyphtane [nitroglyptal?] dye for shoes.

"Another innovation of minor chemistry is a foam-cleaner for carpets. Soon the factory "Spindulis" in Yashyanay will begin manufacturing it. This enterprise has also mastered the production of a new chemical for polishing furniture -- Neringa.

"But not everything at the exhibit was honored with a good rating. The greatest pretense of all was in the quality of the oil paints put out by the Vilnius chemical plant Shvituris. The poor external form of the individual articles was obvious.

"A number of fine products of consumer-goods chemistry was displayed at the exhibit by the industries of Latvia, Belorussia, and Estonia. An innovation of the Estonians is the packaging of creams for shoes in plastic tubes instead of in tin boxes. The Estonians have begun packaging cosmetics in polyethylene bottles. By the way, the latter are significantly cheaper than glass bottles.

"After the group examined the exhibit, the conference was opened by A. Didzhyulis, the deputy chairman of the Lithuanian Sovnarkhoz. Next appeared A. Spudulis, the head administrator of chemical industry of the sovnarkhoz, who told those gathered about the development of consumer-goods chemistry in Lithuania. Now, in our republic, more than 40 items are produced in this branch of industry. Recently, enterprises stated to specialize in chemical consumer goods, which had a favorable effect on increasing the output and the raising of the quality of production. However, this is only the beginning of that great task which must be carried out for the full satisfaction of the ever-growing demand of workers for the products of consumer-goods chemistry.

"Also appearing on the first day of the conference were N. Neyshadt, the deputy director of the All-Union Scientific Research Technological Institute of Chemical Products; N. Leytman, a senior engineer of the division of construction materials of peat and chemistry of the Byelorussian Glavmestprom; E. Kasari, an administrative engineer of the slate and chemical industry of Estonia; K. Kibers, the director of the chemical factory "Slodriba" of the Latvian Sovnarkhoz; and others."

### 63. Yugoslav Formaldehyde Production

"Plant for the Production of Formaldehyde Put Into Regular Operation in Vitkovici," by A. Novakovic; Belgrade, Borba, 24 Sep 62, p 5

On 23 September 1962, ceremonies were held marking the start of regular operation of a new unit for the production of formaldehyde in the Nitrogen Compounds Factory in Vitkovici near Gorazde. The new unit will produce formaldehyde from domestic raw materials. Until now, formaldehyde was produced only in the "Chromos" Chemical Industry in Zagreb, from imported methanol.

The factory put 120 million dinars of its own funds into the construction of the plant. At first, it will produce 2,000 tons of formaldehyde annually, which will satisfy the needs of this factory in the production of synthetic adhesives; but plans are being made to expand the plant and increase production to 8,000 tons of formaldehyde annually.

### 64. Work on Diamine Synthesis

"Indisputable Synthesis of 4,5,N<sup>1</sup>, N<sup>1</sup>,-Tetramethyl-1,2-diaminobenzene," by V. M. Berezovskiy, L. N. Gurko, and Ye. P. Rodionova, All-Union Scientific-Research Vitamin Institute; Moscow, Zhurnal Obshchey Khimii, Vol 32, No 9, Sep 62, pp 2951-2954

While studying the reaction of alloxan with aromatic mono- and diamines, it becomes necessary to obtain a primary-tertiary ortho-diamine with substituents in positions para to each of the amino groups. A compound meeting this requirement was 4,5,N<sup>1</sup>,N<sup>1</sup>-tetramethyl-1,2-diaminobenzene. This compound was synthesized indisputably, i.e., so that there was no doubt regarding the structure of the product, by N-methylathion of 3,4-dimethyl-6-(3',4'-dimethylphenylazo)aminobenzene, whose structure is well established, followed by reduction.

Conferences and Meetings65. Conference in Yerevan Discusses Synthesis From Acetylene

"All-Union Conference of Chemists"; Moscow, Kommunist,  
20 Oct 62, p 3

The All-Union Conference on "Synthesis From Acetylene" opened on 19 October in Yerevan. It was called by the Coordinating Committee on Scientific Research of the Council of Ministers of the republic, by the Academy of Sciences and the Sovnarkhoz of Armenia, and by the All-Union Chemical Society imeni D. I. Mendeleev. Scholars from institutes in Moscow, Leningrad, Georgia, Azerbaydhan, Kazakhstan, and Armenia are participating. They represent the Institute of Organic Chemistry and the Institute of Chemistry of Natural Compounds of the Academy of Sciences USSR, the Institute of Fine Chemical Technology imeni Lomonosov, the Leningrad Chemical-Technological Institute, the Ybilisi State University, the Baku Petroleum-Chemistry Institute, and others.

B. E. Sarkisov, chairman of the Coordinating Committee on Scientific Research of the Armenian Council of Ministers, opened the conference.

On the first day, A. M. Gasparin, director of organic chemistry of the Academy of Sciences Armenian SSR, gave a report on the Armenian chemical industry and the prospects for its development. O. N. Temkin, co-worker of the Moscow Institute of Fine Chemical Technology imeni Lomonosov, discussed his collaboration with Doctor of Chemical Sciences R. M. Flid on the problem "Several Possible Ways of Using Acetylenic Hydrocarbons in the Basic Organic Synthesis of Plastic and of Synthetic Rubber." A. N. Grigoryan, Institute of Chemistry of Natural Compounds of the Academy of Sciences USSR, spoke about work done under Academician M. M. Shemyakin on the synthesis of biologically active materials from acetylene.

S. A. Vartanyan discussed the work of the Institute of Organic Chemistry and the central laboratory of the Yerevan Plant imeni Kirov on the production of new derivatives of acetylenic alcohols and aldehydes.

The conference lasted 5 days.

66. East German Conference on Industrial Waste Waters

"Design and Operation of Neutralization Plants"; Leipzig, Chemische Technik, No 9, Sep 62, p 570

The Chemical Engineering Association, Subcommittee for Industrial Waste Waters -- Chemistry, will hold a conference on the above subject in Leipzig on 15-16 November 1962.

The following program has been scheduled:

1. Lectures on 15 November 1962:

Planning of water-treatment plants; treatment plants from the viewpoint of water control; special tasks in connection with the planning of treatment plants; operation and maintenance of treatment plants.

2. Field trip on 16 November 1962:

Inspection of the treatment plants at the People-Owned Chemical Plant in Coswig, the People-Owned Factory in Wolfen, and an additional enterprise in the Halle-Bitterfeld area.

A limited number of applications can still be accepted. [Signed:] H. Steinbrecher, People-Owned Design and Engineering Office for Chemistry in Leipzig, Subcommittee Chairman.

67. East German Symposium on Gas Chromatography

Announcement; Leipzig, Chemische Technik, No 9, Sep 62, p 553

The People-Owned Leuna Plant "Walter Ulbricht," in conjunction with the Subcommittee for Gas Chromatography of the Chemistry Section of the German Academy of Sciences in Berlin, will hold its Fourth Symposium on Gas Chromatography in the German Democratic Republic. The symposium will be held in Leuna, Kreis Merseburg, on 28-31 May 1963. The program will include lectures dealing with problems of theory, apparatus, and application. There will also be an exhibit of equipment at the conference site.

Further information may be obtained from the secretariat of the Subcommittee for Gas Chromatography, Leipzig 0 5, Permoserstrasse 15.

68a. Meeting on Mass Spectrometry

"Physics Arms Chemists"; Kiev, Pravda Ukrainy, No 122 (6141), 25 May 62, page 1

A general meeting of the Department of Chemical Sciences, Academy of Sciences USSR, which ended on 23 May was devoted to the application of physical methods of research in chemistry. Problems related to the application of mass spectrometry in particular were discussed. Utilization of this method allowed chemists to conduct analyses of substances present in quantities of one trillionth part of a gram.

68b. Recent Soviet Conferences in Chemistry and Metallurgy

The conferences listed below were reported or announced in recent issues of Soviet periodicals. Included in the listing are the dates and location of the conference, sponsoring organizations, and source. Unless otherwise indicated, it is assumed that there was no non-Soviet participation in the conferences.

a. Fourth Conference on the Electrochemistry of Organic Compounds; 28-30 March 1962, Moscow; sponsored by the Institute of Electrochemistry of the Academy of Sciences USSR and the Electrochemistry Section of the All-Union Chemical Society imeni Mendeleev. (Vestnik Akademii Nauk SSSR, No 8, Aug 62, p 123)

b. 16 Hydrochemical Conference; 5-8 May 1962, Novochoerkassk. (Vestnik Akademii Nauk SSSR, No 8, Aug 62, p 124)

c. Conference Devoted to a Discussion of the Concept of Electronegativity; 5-6 April 1962, Moscow; sponsored by the Inorganic Chemistry Section of the Moscow Branch of the All-Union Chemical Society imeni Mendeleev, the Institute of General and Inorganic Chemistry imeni N. S. Kurnakov of the Academy of Sciences USSR, and Moscow State University imeni M. V. Lomonosov. (Zhurnal Strukturnoy Khimii, Vol 3, No 4, Jul/Aug 62, p 495)

d. Conference on the Physical Chemistry and Technology of Starch; June 1962; sponsored by the Committee on Physical and Colloidal Chemistry and the Section on the Starch-Sugar Industry of the Central Board of the Scientific-Technical Society of the Food Industry, the Physical Chemistry Section of the Moscow House of Scientists of the Academy of Sciences USSR, and the Central Institute of the Starch Syrup Industry. (Spirtovalaya Promyshlennost', No 6, 1962, p 46)

e. Conference on Problems of the Status and Prospects for Development of the Production and Demand of R claimed Rubber; 27-29 March 1962, Moscow; sponsored by the Tire Administration, the Scientific-Research Institute of the Tire Industry, and the RTI of the State Committee of the Council of Ministers USSR on Chemistry. (Kauchuk i Rezina, No 8, 1962, p 56)

f. Conference on Light-Weight Refractories; June 1962, Borovichskiy Combine; sponsored by the Refractories Section of the Leningrad Oblast Board of the Scientific-Technical Society of Ferrous Metallurgy. (Ogneupory, No 10, 1962, p 481)

g. Scientific-Technical Conference on the Question of Improving Open-Pit Mining of Refractory and Nonmetallic Raw Materials in Enterprises of the "Ogneupornerud" Trust; June 1962, Donetsk; sponsored by the Donetsk Oblast Board of the Scientific-Technical Society of Ferrous Metallurgy, the Institute of Mining of the Academy of Sciences Ukrainian SSR, the Central Bureau of Technical Information of the Donetsk Sovnarkhoz, and the "Ogneupornerud" Trust. (Ogneupory, No 10, 1962, p 479)

h. Symposium on New Photographic Processes; 31 October 1962, Moscow. (Zhurnal Nauchnoy i Prikladnoy Fotografii i Kinematografii, Vol 7, No 5, Sep/Oct 62, p 402)

i. Fourth All-Union Scientific-Technical Conference on Physical Metallurgy and Progressive Methods of the Heat Treatment of Metals; 5-7 June 1962, Rostov-na-Donu; sponsored by the Rostov Sovnarkhoz, the Rostov Oblast Board of the Scientific-Technical Society of the Machine Building Industry, the Rostov Scientific-Research Institute of Machine Building Technology, and the Section on Physical Metallurgy and Heat Treatment of the Central Board of the Scientific-Technical Society of the Machine Building Industry. (Metallovedeniye i Termicheskaya Obrabotka Metallov, No 9, Sep 62, p 61)

j. Scientific-Technical Conference on Theoretical and Experimental Investigations of High Strength Metals, Steels, and Alloys; 2-3 April 1962, Moscow; sponsored by the Institute of Metallurgy imeni A. A. Baykov. (Metallovedeniye i Termicheskaya Obrabotka Metallov, No 9, Sep 62, p 62)

k. Second Seminar on Theoretical and Experimental Investigations of Titanium Alloys; 9-12 March 1962, Moscow; sponsored by the Laboratory of the Chemistry of Metal Alloys of the Institute of Metallurgy imeni A. A. Baykov. (Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 4, Jul/Aug 62, p 189)

- l. Conference on Problems of the Recovery of Metals; 20 April 1962; sponsored by the Physicochemical Section of the Scientific Council on "New Processes and Alloys in Metallurgy" of the State Committee of the Council of Ministers USSR for Coordination of Scientific Research Work. (Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 4, Jul/Aug 62, p 191)
- m. Technical Conference on High Concentration of Iron Ore in the Krivoy Rog Basin; no date given, Krivoy Rog; sponsored by the Dnepropetrovsk Sovnarkhoz, the Krivoy Rog City Party, and the "Mekhanobrchermet" Institute. (Metallurgicheskaya i Gornorudnaya Promyshlennost', No 4, Jul/Aug 62, p 87)
- n. Seminar of Specialists/Members of CEMA on Problems of Improving the Technology of Hydrometallurgical Production of Zinc; 7-13 July 1962, Ordzhonikidze, and June, in Poland; sponsored by CEMA. (Tsvetnyye Metally, No 10, Oct 62, p 85)
- o. Ukrainian Republic Conference on the Ordering of Atoms and Its Influence on the Properties of Alloys; 17-21 April 1962, Kiev; sponsored by the Institute of Metal Physics of the Academy of Sciences Ukrainian SSR. (Metallovedeniye i Termicheskaya Obrabotka Metallov, No 8, Aug 62, p 59)
- p. All-Union Conference of Workers of the Pipe Industry; April 1962, Dnepropetrovsk; sponsored by Gosplan USSR, the Dnepropetrovsk Sovnarkhoz, and the Scientific-Technical Society of Ferrous Metallurgy. (Metallurgicheskaya i Gornorudnaya Promyshlennost', No 4, Jul/Aug 62, p 85; Stal', No 10, Oct 62, p 937)
- q. Second Scientific-Technical Conference on Diffusion Welding in a Vacuum; 24-26 May 1962, Moscow; sponsored by the Oblast Board of the Scientific-Technical Society of the Machine Building Industry and the NIL of the Moscow City Sovnarkhoz on Diffusion Welding in a Vacuum. (Svarochnoye Proizvodstvo, No 9, Sep 62, p 42)
- r. Seminar on Problems of Automatic Welding Under a Layer of Flux and in a Protective Gas Atmosphere; October 1962, Yerevan; sponsored by the Institute of Electric Welding imeni B. Ye. Paton of the Academy of Sciences USSR. (Kommunist, 25 Oct 62, p 4)
- s. Conference on Problems of the Theory of Die Casting; 21 December 1961, Moscow; sponsored by the Committee on Nonferrous Casting of the Casting Section of the Central Board of the Scientific-Technical Society of the Machine Building Industry. (Liteynoye Proizvodstvo, No 9, Sep 62, p 44)

t. Moldavian Republic Conference of Welders; May 1962, Tiraspol; sponsored by the State Committee of the Council of Ministers Moldavian SSR for Coordination of Scientific Research Work, the Republic Board of the Scientific-Technical Society of the Machine Building Industry, and the Central Bureau of Technical Information of the Sovnarkhoz. (Svarochnoye Proizvodstvo, No 9, Sep 62, p 43)

u. Transcaucasian Conference on the Introduction of New Welding Techniques; 13 October 1962, possible in Tbilisi. (Zarya Vostoka, 13 Oct 62, p 2)

v. Scientific-Technical Conference on the Automation of Blooming, Slabbing, and Universal Mills; end of 1961, Dnepropetrovsk; sponsored by the Commission on Automation of Ferrous Metallurgy of the Scientific Council on Automatics and Cybernetics under the Presidium of the Academy of Sciences Ukrainian SSR, the Institute of Ferrous Metallurgy of the Academy of Sciences Ukrainian SSR, the Dnepropetrovsk Sovnarkhoz, and the Oblast Board of the Scientific-Technical Society of Ferrous Metallurgy. (Metallurgiya i Gornorudnaya Promyshlennost', No 2, Mar/Apr 62, p 78)

w. Session of the Scientific Council on the Use of the Energy of Explosions in the Economy; 21-25 May 1962, Kiev. (Metallurgicheskaya i Gornorudnaya Promyshlennost', No 4, Jul/Aug 62, p 89)

## II. METALLURGY

Corrosion69. Corrosion of Steels and Nickel-Chromium Alloys in Molten Chlorides

"Corrosion of Steels and Nickel-Chromium Alloys in Molten Chloride Mixtures," by S. I. Stepanov and Ye. B. Kachina-Pullo, Bereznykov Branch of the All-Union Aluminum and Magnesium Institute; Leningrad, Zhurnal Prikladnoy Khimii, Vol 35, No 8, Aug 62, pp 1852-1855

This work was conducted to study the corrosion of low carbon steel, St.-2; chromium-nickel steels EYa-2, EI-268, and EI-811; and nickel base alloys EI-703, EI-602, EI 435, and VZh-98 in magnesium, potassium, and sodium chloride mixtures at temperatures of 700°, 750°, and 800°C. It was shown that the corrosion resistance of these steels and alloys in the molten chlorides increases with increase of the nickel content. It is proposed that the surface coating which forms on the metal after some time in the molten bath may be of a protective type, but further investigations are required.

70. Corrosion of Zirconium and Titanium and Their Alloys in Nitric and Phosphoric Acids

"Corrosion and Electrochemical Behavior of Zirconium, Titanium, and Zirconium-Titanium Alloys in Phosphoric and Nitric Acids," by A. I. Glukhova and V. V. Andreyeva, Institute of Physical Chemistry, Academy of Sciences USSR; Leningrad, Zhurnal Prikladnoy Khimii, Vol 35, No 8, Aug 62, pp 1778-1786

This work was conducted to study the corrosion resistance of zirconium and titanium and their alloys in phosphoric and nitric acid solutions.

Studies showed that zirconium has good corrosion resistance in phosphoric acid solutions up to a 40% concentration at 100°C. Titanium is stable in phosphoric acid solutions in concentrations up to 88% at 20°C and up to 20% at 40°C. Alloying zirconium with titanium lowers the corrosion resistance of zirconium in phosphoric acid, but zirconium-titanium alloys are stable or sufficiently stable in phosphoric acid solutions in concentrations up to 60% at 40°C.

In nitric acid solutions, both titanium and zirconium are highly resistant to corrosion over a wide temperature and concentration range; however, zirconium is almost ten times more resistant than titanium. It was noted that the rate of corrosion is much faster for the alloys than for the pure elements.

In phosphoric and nitric acid solutions, both zirconium and titanium are oxidized by anodic polarization. In an 88% acid solution, the thickness of the coating on zirconium after a 3-hour anodizing at +1.35v is 1.5-3.0 microns.

Addition of nitric acid to the phosphoric acid solution promotes a shifting of the potential to a positive voltage for both titanium and zirconium, thereby decreasing the corrosion rate.

#### 71. Corrosion Resistance of Zirconium and Titanium in Sulphuric Acid

"Corrosion Resistance and Electrochemical Properties of Zirconium, Titanium, and Zirconium-Titanium Alloys in Sulfuric Acid Solutions," by V. V. Andreyeva and A. I. Glukhova; Leningrad, Zhurnal Prikladnoy Khimii, Vol 35, No 8, Aug 62, pp 1771-1777

This work was conducted to test the corrosion resistance of zirconium and titanium and their alloys in sulfuric acid solutions at various concentrations and temperatures to determine their suitability for use in the manufacture of chemical equipment.

Using the criterion of 0.1 g/m<sup>2</sup>-hr as the maximum value to be considered corrosion resistant, it was found that corrosion resistance increases with increased zirconium content up to 80% acid solution. Above an 80% acid concentration, zirconium is not resistant.

The use of a positive current density provides anodic protection for both the alloys and the pure elements discussed here.

Addition of Zr<sup>+4</sup> ions to the acid solution decreases the corrosion rate or fully passivates the zirconium, depending upon the amount of ion addition and upon the temperature and concentration of the sulfuric acid.

#### 72. Corrosion Testing of Shipbuilding Materials

"Corrosion of Shipbuilding Materials in Sea Water," by Ingr P. S. Shcherbakov; Yu. Ye. Zobachev, Candidate of Technical Science; and L. A. Suprun, Candidate of Technical Sciences, Central Scientific-Research Institute for the Maritime Fleet; Leningrad, Sudostroyeniya, No 6, Jun 62, pp 55-59

Corrosion rates of a number of steel and alloy plates in flowing sea water are studied. The metal plates subjected to corrosion tests were made of the following materials.

Carbon and low-alloy steels: 4S SKhL-1, SKhL-4, MS-1, O9G2, and 18DGS

Austenitic and martensitic steels: 1Kh18N9T, Kh23N18, LKh19N12M3T, Kh18N28M3D4T, OKh17N3G4D2T, and 1Kh14ND

Gray and high-strength iron: SCh24-44 and VCh50-1.5

Copper alloy: M3

Bronzes: AZhN 10-4-4, AZh 9-4, AZhMts 10-2, AMts 9-2, OTsSN3-7-5-1, and MNZh-5

Brasses: IMtsZh 55-3-1, Lo 62-1, and MNZh 5-1

Magnesium alloys: ML-2, ML-4, and ML-5

Aluminum alloys: AMTs-15-10

### Extraction and Refining

#### 73. Calculation of the Distribution Coefficient for Zone Refining

"Determination of the Effective Coefficients of Distribution During Zonal Recrystallization," by V. N. Vigdorovich and K. M. Rozin; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 2, Mar/Apr 62, pp 63-65

A mathematical relationship is derived whereby the coefficient of distribution during zone recrystallization can be calculated without knowing the initial solute concentration and with a minimum of two passes.

Also discussed was the zone refining of aluminum after the oxide coating was removed by filtering the metal from a combustion boat through graphite flakes. It was noted that when filtering through the graphite flakes the uniformity of the ingot is disturbed by the harmful effect of the oxide coating. The influence of vacuum degasification was also studied and found to have a favorable effect on the zone refining process.

74. Ion Exchange Separation of Chromium, Vanadium, and Cerium From Manganese

"Separation of Chromium, Vanadium, and Cerium From Manganese by Ion Exchange," by R. N. Golovatyy and V. V. Oshchapovskiy, L'vov State University imeni Ivan Franko; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 28, No 4, 1962, pp 518-521

A study was made on the separation of manganese, chromium, vanadium, and cerium using "tayron," a disodium salt of pyrocatechin-3, 5-disulfonic acid, to which  $Mn(NO_3)_2$ ,  $Cr_2(SO_4)_3$ ,  $Ce(NO_3)_3$ ,  $Ce(SO_4)_2$ , and  $NaVO_3$  solutions were each added to the "tayron" to form the respective "tayronate." The stability of the complexes formed with relation to pH was studied by chromatographic means, and it was shown that chromium, vanadium, and cerium can possibly be separated in a single operation.

A method for the separation of manganese from Al-Mn-Ce alloys with the use of "tayron" was developed since aluminum forms a stable "tayronate" complex and is separated along with the cerium.

75. Liquid-Liquid Extraction of Zirconium and Hafnium

"Extraction of Zirconium and Hafnium From a Mixture of Nitric and Perchloric Acids With Tributylphosphate," by S. S. Korovin, K. Dedich, Ye. N. Lebedeva, and A. M. Reznik, Moscow Institute of Fine Chemical Technology imeni M. V. Lomonosov, Chair for the Technology of Rare and Dispersed Elements; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 10, Oct 62, pp 2475-2477

Results of extracting zirconium and hafnium from an aqueous mixture of  $HNO_3 + HClO_4$  and TBF (tributylphosphate) + o-xylene are given. Activities of zirconium and hafnium in relation to equilibrium concentrations in the aqueous and organic phases are discussed in conjunction with the distribution of these elements in the two phases.

76. Purification of Beryllium Sulfate Solutions

"Purification of Beryllium Sulfate Solutions From Iron and Other Impurities by Electrolysis With a Mercury Cathode," by A. I. Layner and M. A. Klenkova, Krasnoyarsk Institute of Nonferrous Metals Imeni M. I. Kalinin; Leningrad, Zhurnal Prikladnoy Khimii, Vol 35, No 8, Aug 62, pp 1815-1820

The process of obtaining high-purity beryllium salts was studied in order to determine the fastest method and best conditions for the separation of beryllium from iron in sulphate solutions. In the course of the experiments, it was found that beryllium can be separated from a large number of other mixtures.

Increased current density and solution pH, depending on the concentration of iron in the solution, were found to give the best results. Also, higher pH of the solution helps to reduce the consumption of electric power needed for the process.

77. Synthesis of Uranium Dioxide

"Synthesis of  $UO_2$  by Reduction of Hexavalent Uranium With Elemental Sulfur Under Hydrothermal Conditions," by R. P. Rafal'skiy, A. D. Vlasov, and K. F. Kudinova; Moscow; Atomnaya Energiya, Vol 13, No 2, Aug 62, pp 181-183

A method is described for synthesizing  $UO_2$  from  $UO_2SO_4-S_2$  solutions with a comparatively low oxygen coefficient. The sulfur which is usually present in the product can be easily removed by organic reagents or by vacuum distillation.

Mechanical Testing

78. Deformation of Palladium at Elevated Temperatures

"Microstructure Investigation on the Deformation of Palladium in a Process of Straining at Elevated Temperatures," by M. G. Lozinskiy and N. Z. Pertsovskiy, Institute of Machine Sciences; Moscow, Izvestiya Akademii Nauk SSSR, otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 2, Mar/Apr 62, pp 136-144

This study was made by subjecting specimens of technically pure palladium to constant load at 400 and 600°C, which provided a uniform creep rate of 0.3-0.7%/hr.

The mechanism of deformation is characterized by a process of intragranular slip deformation. The origination and development of straight and curved slip were observed which were formed as a result of both translation and transverse slip. At 600°C, the slip zone widens and the formation of intergranular cracks begins.

79. High-Temperature Creep Testing

"Attachment for Creep Testing at Very High Temperatures,"  
by V. S. Vlasov; Moscow, Zavodskaya Laboratoriya, No 7,  
Jul 62, pp 868-871

A description is given of an attachment for the TVV-4 furnace creep and ductility testing at temperatures up to 1,500°C in a vacuum ( $10^{-4}$  mm Hg) or inert atmosphere and at pressures down to 0.5 atm.

Strain-time-temperature curves are given for creep tests on 10-80-10% and 10-70-20% Ti-V-Nb alloys at 850° and 950°C, and the VM-2 molybdenum alloy, at 1,500°C.

Testing at 1500°C was done in a water-cooled molybdenum enclosure. It was concluded that creep testing could be carried out in a tungsten enclosure at temperatures up to 2,500° C.

80. Low Temperature Testing of Titanium Alloys

"Investigation of the Ductility of Alpha-Titanium Solid Solutions at -196°C," by O. K. Belousov, I. I. Kornilov, and V. S. Mikheyev, Institute of Metallurgy imeni A. A. Baykov; Moscow, Doklady Akademii Nauk SSSR, Vol 145, No 5, 11 Aug 62, pp 1102-1105

Investigations on the formation of alpha-titanium solid solutions were conducted on the following ternary systems: Ti-Zr-V, Ti-Zr-Mo, Ti-Zr-Nb, Ti-V-Mo, and Ti-V-Nb. Alloys of these systems which exhibited good strength and ductility at room temperature (20°C) and at -196°C were tested for impact strength and compared with other structural metals and alloys. Mechanical properties of these are given below:

	Tensile ( $\text{kg/mm}^2$ )	Elongation %	Reduction in Area %	Impact ( $\text{kg/cm}^2$ )
AT-2-1	80.0(119.5)*	20.9(13.8)	65.5(37.6)	17.8(11.2)
AT-2-2	75.6(116.0)	23.9(12.5)	69.4(44.6)	19.2(15.8)
AT-2-4	65.5(98.6)	25.0(19.4)	71.2(69.8)	24.1(20.3)
Duralumin	40.0(50.0)	--	--	4.2(3.24)
Armco Iron	32.0(78.5)	--	--	24.07(0.13)
Steel Kh-3-N	99.7(--)	--	--	11.77(4.05)
Steel U-4	95.0(--)	--	--	12.15(0.68)

\*Values in ( ) denote tests at  $-196^{\circ}\text{C}$ .

Alloys of titanium with other elements located close to titanium in the periodic table have similar mechanical properties at both room temperature and at  $-196^{\circ}\text{C}$ . This is explained by their solubility in titanium and the formation of alpha solid solutions. Titanium alloys of the AT-2 series (chemical composition not given) were found to have the best low temperature properties.

81. New Low-and High-Temperature Testing Machine

"Machine for Testing Materials Under Tension or Compression at Temperatures From  $1.4^{\circ}$  to  $1,500^{\circ}\text{K}$ ," by R. I. Garber, I. A. Gindin, N. I. Malik, and Ya. D. Starodubov, Physicotechnical Institute, Academy of Sciences Ukrainian SSR; Moscow, Zavodskaya Laboratoriya, No 7, Jul 62, pp 865-868

A new machine is described, with accompanying photograph and cut-away drawings for testing materials under tension or compression at high or low temperatures, and in a vacuum or active media. The unit has its own optical and photographic system for direct observation or photographic recording.

Stress-strain curves are given for copper tested under tension at  $1.4^{\circ}\text{K}$  and for tantalum under compression at  $4.2^{\circ}\text{K}$  (No name or model designation is given.)

Phase Diagram Studies

82. Investigation of the  $\text{Ni}_3\text{Al-Ni}_3\text{Nb}$  System," by R. S. Mints, G. F. Belyayeva, and Yu. S. Málkov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 10, Oct 62, pp 2382-2387

A complete study of the  $\text{Ni}_3\text{Al-Ni}_3\text{Nb}$  system is presented. Data from the experiment are presented in a table which consists of temperatures for the start and finish of crystallization, microstructures at various temperatures, resistivity and Vicker's hardness for the quenched and annealed conditions, and crystal structure and lattice parameters.

83. Investigation of the Ti-Al-Ni System

"Ti-Al-Ni Composition Diagram," by U. Zhen Ken and M. I. Zamotin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 7, No 10, Oct 62, pp 2378-2381

The titanium rich portion of the Ti-Al-Ni- ternary system is investigated in the regions of 0-35% Al and 0-35% Ni. Isothermal sections of the system are given for 550°, 700°, 800°, and 900°C. Polythermal sections of the system are given for different Al-Ni content. The existence of various solid solutions and transformations is discussed.

84. Thallium-Tin Phase Diagram

"Tl-Sn Phase Diagram," by A. I. Zakharov and Ye. G. Ponyatovskiy, Central Scientific-Research Institute of Ferrous Metallurgy; Moscow, Zhurnal Neorganicheskoy Khimii, Vol. 7, No 10, Oct 62, pp 2374-2377

The phase diagram of the Tl-Sn system was investigated in the high thallium region (0-15% Sn) in the temperature range from 20°C to the melting point of thallium (303°C). Three distinct phases were noted which comprised three different crystal structures: alpha-phase (HCP), beta-phase (BCC), and delta-phase (FCC). At 84°C and 4.5% Sn, a beta → alpha+delta eutectoid point exists. It was determined by X-ray analysis that a peritectic reaction occurs near 265°C at approximately 15% Sn.

Power Metallurgy85. Investigation of the Structure and Properties of Sintered Aluminum Powder (SAP)

"The Structure and Properties of SAP," by A. I. Paisov, A. I. Kolpashnikov, and P'ang Ya-Ch'eng; Moscow, Tsvetnyye Metally, No 10, Oct 62, pp 71-75

The effects of chemical composition and mechanical working on the structure and properties of sintered aluminum powder (SAP) are examined. Results are compared with data from the literature source Teploprochnyy Material iz Spechnennoy Alyuminiyevoy Pudry (A Heat-Resistant Material Made of Sintered Aluminum Powder), Oborongiz, 1961. It is shown that cold rolling considerably increases the strength characteristics of SAP due to the cold hardening of the aluminum matrix; the hardening effect produced by hot rolling (450°C) is relatively low. Distribution of the oxide particles in the aluminum matrix is improved by both types of rolling. Neither type of rolling improves the properties of SAP at elevated temperatures, on the contrary, it was established that cold rolling has a detrimental effect. The role of small additions of zirconium in the structural differences of test specimens was not resolved.

86. High-Temperature Thermocouple

"Measuring the Temperature of Metal Baths"; Budapest, Nepszeru Technika, Vol XI, No 10, Oct 62, inside front cover

"The Institute of Powder Metallurgy of the Soviet Academy of Sciences" has developed an improved thermocouple for recording the temperature of steel baths. The immersed end consists of three layers: the outer layer is made of zirconium boride for protection against chemical action, the middle layer is of zirconium boride mixed with aluminum-oxide powder to ensure a high heat conductivity; and the core is of aluminum-oxide which responds rapidly to temperature fluctuations.

This device, which does not permit gas to pass through, can remain immersed in a steel bath for as long as 2 hours without being damaged.

Miscellaneous87. Liquid Thermodynamic Properties of the Mg-Al System

"Thermodynamic Properties of Liquid Solutions in the Mg-Al System," by V. N. Yeremenko and G. M. Lukashenko, Institute of Powder Metallurgy and Special Alloys, Academy of Sciences Ukrainian USSR; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 28, No 4, 1962, pp 462-466

The thermodynamic properties of magnesium-aluminum alloys of various composition are investigated. Data obtained from emf measurements at 650°C are given.

It was found that the Mg-Al system is characterized by a small deviation from the ideal bimetallic system. Maximum change in residual free energy was found to be -140 cal/mol at a 40-60 Mg-Al composition. Maximum change in the heat of mixing (-ΔH) was 400 cal/mole and occurred just on the aluminum side of the 50-50 equiatomic composition. The entropy of mixing for this system is near to the ideal entropy.

88. New Geochemical Reagent

"Rapid Analysis of Metal"; Frunze, Sovetskaya Kirgiziya, No 161 (10241), 10 Jul 62, p 4

"A new highly sensitive reagent, thiyoxine has been developed at the Institute of Chemistry, Academy of Sciences Latvian SSR. The use of Thiyoxine makes it possible to detect metals in ores and minerals in quantities as small as millionths of a percent."

89. New Low-Nickel Stainless Steels in Production

"New Grade of Stainless Steel," by B. G. Vecherya and Yu. V. Klubus; Moscow, Liteynoye Proizvodstvo, No 9, Sep 62, pp 43-44

Data are given on the physical and chemical properties of the new stainless casting steels 1Kh18N4G4L (4.0-5.0% Ni) and 2Kh18N4G4L (3.5-5.0% Ni) which have been introduced into production at the "Bol'shevik" Plant in Kiev. Steel 1Kh18N4G4L is melted from high-purity materials but can also be produced from scrap of this alloyed steel with oxygen blowing. Steel 2Kh18N4G4L does not require high-purity materials and can be melted from scrap without the use of oxygen. Corrosion tests in 25% boiling nitric acid showed that the 2Kh18N4G4L grade can be used as a replacement for steel 1Kh18N9T. The casting properties of these new steels are claimed to be superior to those of the 18-8 type of steel.

90. Peculiarity of the Bi-Sb System

"Effect of the Cooling Rate on Crystallization of Bi-Sb Alloys," by V. M. Glazov; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Metallurgiya i Toplivo, No 2, Mar Apr 62, pp 66-70

A study was made of the microstructure and microhardness of Bi-Sb alloys heated to the liquid-solid state and quenched in various media. It was concluded that the crystallization process is one of diffusion, and even at the most rapid cooling rates (up to  $10^5$  degrees/min.) it is impossible by means of quenching to fix the composition of the alloys as they exist in the liquid-solid phase equilibrium.

100. Surface Tension of Molten Systems

"Surface Tension of Liquid Alloys of Binary Metallic Systems With Liquidus Curve Maximums," by V. N. Yeremenko, V. I. Nizhenko, N. I. Levi, and B. B. Bogtyrenko, Institute of Powder Metallurgy and Special Alloys, Academy of Sciences Ukrainian SSR; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 28, No 4, 1962 pp 500-505

This work was performed to study the surface tension of systems which form intermetallic compounds in the solid state and have satisfactory strength at high temperatures as shown by their high melting points and liquidus curve maximums.

Ni-Be and Ni-Al systems were investigated by the static drop method in which NiBe and NiAl compounds congruently melt at 1,472 and 1,638°C, respectively. Surface tension measurements were made in a vacuum at 1,500°C for the Ni-Be system, and at 1,640°C for the Ni-Al system.

Alloys of these systems resisted chemical reaction upon melting as shown by the volume contraction and negative slope of the isotherm of reciprocal density versus alloy composition.

Results showed that the Ni-Be system forms a type I surface tension isotherm according to Trifonov's classification, and the Ni-Al system forms a type III isotherm. Results also showed that there is a reduced amount of molecular grouping which provides an answer for the composition of the intermetallic phases existing in the solid state.

Investigation of the behavior of surface tension isotherms above the maximum led to the assumption that a second congruently melting compound, Ni<sub>5</sub>Be<sub>21</sub>, with a melting point of 1,264°C, will appear on the isotherm as a point of inflection.

101. Welding in Space

"There Is a Real Possibility of Welding in Space"; Prague, Rude Pravo, 16 Oct 62, p 3

Academician Boris Paton, President of the Ukrainian Academy of Science, told a recent conference of welding specialists from the Georgian, Azerbaidzhan, and Armenian SSR, that welding in space is a realistic possibility. In the near future, when interplanetary travel is attempted, it will be necessary to assemble various structural components in space, Paton stated. This will be possible by means of electron beam welding in a vacuum, a method developed by Ukrainian scientists, he indicated.

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\* \* \*

Best Available Copy



Washington, D.C. 20505

7 September 2004

Ms. Roberta Schoen  
Deputy Director for Operations  
Defense Technical Information Center  
7725 John J. Kingman Road  
Suite 0944  
Ft. Belvoir, VA 22060

Dear Ms. Schoen:

In February of this year, DTIC provided the CIA Declassification Center with a referral list of CIA documents held in the DTIC library. This referral was a follow on to the list of National Intelligence Surveys provided earlier in the year.

We have completed a declassification review of the "Non-NIS" referral list and include the results of that review as Enclosure 1. Of the 220 documents identified in our declassification database, only three are classified. These three are in the Release in Part category and may be released to the public once specified portions of the documents are removed. Sanitization instructions for these documents are included with Enclosure 1.

In addition to the documents addressed in Enclosure 1, 14 other documents were unable to be identified. DTIC then provided the CDC with hard copies of these documents in April 2004 for declassification review. The results of this review are provided as Enclosure 2.

We at CIA greatly appreciate your cooperation in this matter. Should you have any questions concerning this letter and for coordination of any further developments, please contact Donald Black of this office at (703) 613-1415.

Sincerely,

A handwritten signature in black ink that reads "Sergio N. Alcivar".

Sergio N. Alcivar  
Chief, CIA Declassification Center,  
Declassification Review and Referral  
Branch

Enclosures:

1. Declassification Review of CIA Documents at DTIC (with sanitization instructions for 3 documents)
2. Declassification Status of CIA Documents (hard copy) Referred by DTIC (with review processing sheets for each document)



## Processing of OGA-Held CIA Documents

The following CIA documents located at DTIC were reviewed  
by CIA and declassification guidance has been provided.

OGA Doc ID	Job Num	Box	Fldr	Doc	Doc ID	Document Title	Pub Date	Pages	Decision	Proc Date
AD0463342	78-03109A	55	1	2	88	Consolidated Translation Survey For April 1965	4/1/1965	190	Approved For Release	3/25/2004
AD0465168	78-03109A	55	1	3	89	Consolidated Translation Survey For May 1965	5/1/1965	245	Approved For Release	3/25/2004
AD0467068	78-03109A	55	1	4	90	Consolidated Translation Survey For June 1965	6/1/1965	221	Approved For Release	3/25/2004
AD0468849	78-03109A	55	1	5	91	Consolidated Translation Survey For July 1965	7/1/1965	218	Approved For Release	3/25/2004
AD0471155	78-03109A	55	1	6	92	Consolidated Translation Survey For August 1965	8/1/1965	236	Approved For Release	3/25/2004
AD0473500	78-03109A	55	1	7	93	Consolidated Translation Survey For September 1965	9/1/1965	221	Approved For Release	3/25/2004
AD0474384	78-03109A	55	1	8	94	Consolidated Translation Survey For October 1965	10/1/1965	181	Approved For Release	3/25/2004
AD0475860	78-03109A	55	1	9	95	Consolidated Translation Survey For November 1965	11/1/1965	305	Approved For Release	3/25/2004
AD0477388	78-03109A	56	1	1	96	Consolidated Translation Survey For December 1965	12/1/1965	181	Approved For Release	3/25/2004
AD0478471	78-03109A	56	1	2	97	Consolidated Translation Survey For January 1966	1/1/1966	198	Approved For Release	3/25/2004
AD0479675	78-03109A	56	1	3	98	Consolidated Translation Survey For February 1966	2/1/1966	354	Approved For Release	3/25/2004
AD0481681	78-03109A	56	1	4	99	Consolidated Translation Survey For March 1966	3/1/1966	237	Approved For Release	3/25/2004
AD0334379	78-03117A	191	1	37	4255	Status And Activities Of Prominent Scientists In Communist China In 1962	1/29/1963	53	Approved For Release	3/29/2004
AD0333974	78-03117A	190	1	35	4212	Scientific Information Report Outer Mongolia (1)	1/17/1963	27	Approved For Release	3/29/2004
AD0335202	78-03117A	195	1	13	4394	Scientific Information Report Outer Mongolia (2)	3/13/1963	27	Approved For Release	3/25/2004
AD0332657	78-03117A	183	1	13	3924	Scientific Information Report Biology And Medicine (22)	10/12/1962	76	Approved For Release	3/29/2004
AD0333147	78-03117A	185	1	30	4020	Scientific Information Report Biology And Medicine (23)	11/16/1962	90	Approved For Release	3/29/2004
AD0333427	78-03117A	188	1	13	4112	Scientific Information Report Biology And Medicine (24)	12/13/1962	84	Approved For Release	3/29/2004
AD0334160	78-03117A	190	1	10	4187	Scientific Information Report Biology And Medicine (25)	1/10/1963	69	Approved For Release	3/29/2004
AD0334612	78-03117A	193	1	10	4310	Scientific Information Report Biology And Medicine (26)	2/20/1963	112	Approved For Release	3/29/2004
AD0335309	78-03117A	195	1	32	4413	Scientific Information Report Biology And Medicine (27)	3/20/1963	110	Approved For Release	3/29/2004
AD0336242	78-03117A	198	1	16	4509	Scientific Information Report Biology And Medicine (28)	4/12/1963	81	Approved For Release	3/29/2004
AD0332575	78-03117A	184	1	6	3957	Scientific Information Report Chemistry And Metallurgy (22)	10/23/1962	47	Approved For Release	3/29/2004
AD0333164	78-03117A	187	1	2	4061	Scientific Information Report Chemistry And Metallurgy (23)	11/28/1962	65	Approved For Release	3/25/2004
AD0333857	78-03117A	189	1	22	4160	Scientific Information Report Chemistry And Metallurgy (24)	1/2/1963	57	Approved For Release	3/29/2004
AD0334310	78-03117A	191	1	20	4238	Scientific Information Report Chemistry And Metallurgy (25)	1/28/1963	52	Approved For Release	3/29/2004